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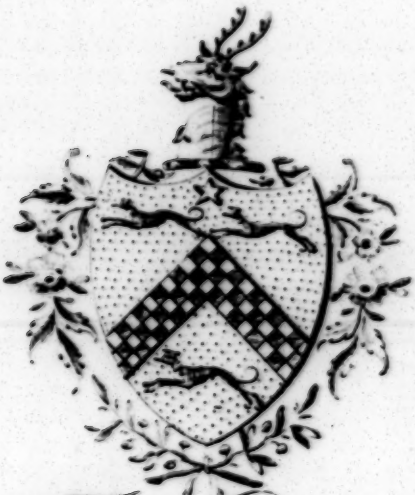


Francis Douce.

Ex Dono Bibl. Boal.

THE TUTOR's ASSISTANT;

BEING A COMPENDIUM of ARITHMETIC, AND A COMPLETE QUESTION-BOOK.

CONTAINING,

I. *Arithmetic* in Whole Numbers; being a brief Explanation of all its Rules, in a new and more concise Method than any hitherto published; with an *Application* to each Rule, consisting of a large Variety of Questions in real Business, with their Answers annexed.

II. *Vulgar Fractions*, which are treated with a great deal of Plainness and Perspicuity.

III. *Decimals*, with the *Extraction* of the *Square*, *Cube*, and *Biquadrate* Roots, after a very plain and familiar Manner; in which are set down *Rules* for the easy Calculation of *Interest*, *Annuities*, and *Pensions* in *Arrears*, the *present Worth* of *Annuities*, &c. either by Simple or Compound Interest.

IV. *Duodecimals*, or *Multiplication* of Feet and Inches, with Examples applied to measuring and working by Multiplication, Practice, and Decimals.

V. A *Collection* of *Questions* set down promiscuously, for the greater Trial of the foregoing *Rules*.

TO WHICH ARE ADDED,

A new and very short Method of extracting the CUBE ROOT, *and a* GENERAL TABLE *for the ready calculating the* INTEREST *of any Sum of Money, at any Rate per Cent. likewise* Rents, Salaries, &c.

The Whole being adapted either as a QUESTION-BOOK for the Use of Schools, or, as a REMEMBRANCER and INSTRUCTOR to such as have some Knowledge therein.

This Work having been perused by several Eminent MATHEMATICIANS *and* ACCOMPTANTS, *is recommended as the best* COMPENDIUM *hitherto published, for the Use of* SCHOOLS, *or for* PRIVATE PERSONS.

THE SIXTEENTH EDITION.

By FRANCIS WALKINGAME,
WRITING-MASTER and ACCOMPTANT.

PRINTED for the AUTHOR,
And Sold by EDWARD JOHNSON, in Ave-Mary-Lane, 1779.

WRITING,

IN ALL THE VARIOUS HANDS NOW IN USE;

ARITHMETIC,

THROUGH ALL ITS DIFFERENT RULES;

VULGAR and DECIMAL FRACTIONS,

WITH THE

Extraction of the Square and Cube Root;

ALSO

DUODECIMALS;

ARE TAUGHT ABROAD, BY

F. WALKINGAME,

In *Great Ruſſel-Street*, BLOOMSBURY:

Where may be had, *The* TUTOR'S ASSISTANT.

PREFACE.

THE Public, no doubt, will be ſurprized to find there is another attempt made to publiſh a Book of ARITHMETIC, when there are ſuch numbers already extant on the ſame Subject, and ſeveral of them that have ſo lately made their appearance in the World; but, I flatter myſelf, that the following reaſons which induced me to compile it, the Method, and the Conciſeneſs of the Rules, which are laid down in ſo plain and familiar a manner, will have ſome weight towards its having a favourable reception.

Having ſome time ago drawn up a Set of Rules, and proper Queſtions, with their Anſwers annexed, for the uſe of my own School, and divided them into ſeveral Books, as well for more eaſe to myſelf, as the readier Improvement

of my Scholars, I found them, by experience, of infinite uſe; for when a Maſter takes upon him that laborious (though unneceſſary) method of writing out the Rules and Queſtions in the children's books, he muſt either be toiling and ſlaving himſelf, after the fatigue of the School is over, to get ready the books for the next day, or elſe muſt loſe that time which would be much better ſpent in inſtructing and opening the minds of his Pupils. There was, however, ſtill an inconvenience which happened them from giving me the Satisfaction I at firſt expected; *i. e.* where there are ſeveral boys in a claſs, ſome one or other muſt wait till the boy who firſt has the book, finiſhes the writing out thoſe rules or queſtions he wants; which detains the others from making that progreſs they otherwiſe might, had they a proper Book of Rules and Examples for each; to remedy which, I was prompted to compile one, in order to have it printed, that might not only be of uſe to my own School, but to ſuch others as would have their Scholars make a quick progreſs. It will alſo be of great uſe to ſuch Gentlemen as have acquired ſome knowledge of numbers at School, to make them the more perfect; likewiſe, to ſuch as have completed themſelves therein, it will prove, after an impartial peruſal,

ruſal, on account of its great variety and brevity, a moſt agreeable and entertaining Exerciſe Book. I ſhall not preſume to ſay any thing more in favour of this Work, but beg leave to refer the unprejudiced reader to the remark of a certain Author *, concerning compoſitions of this nature. His words are as follow:

" And now, after all, it is poſſible that ſome " who like beſt to tread the old beaten path, " and to ſweat at their buſineſs, when they may " do it with pleaſure, may ſtart an objection " againſt the uſe of this well intended ASSISTANT, becauſe the courſe of ARITHMETIC is " always the ſame; and therefore, ſay, *That* " *ſome Boys, lazily inclined, when they ſee another* " *at work upon the ſame Queſtion, will be apt to* " *make his operation paſs for their own.* But theſe " little forgeries are ſoon detected, by the " diligence of the TUTOR: Therefore, as dif- " ferent queſtions to different boys do not in " the leaſt promote their improvement; ſo nei- " ther do the queſtions hinder it. Neither is it " in the power of any Maſter (in the courſe of " his buſineſs (how full of Spirits ſoever he be,

* *Dilworth.*

" to frame new queſtions at pleaſure, in any " Rule; but the ſame queſtion will frequently " occur in the ſame Rule, notwithſtanding his " greateſt care and ſkill to the contrary.

" It may alſo be further objected, *That to " teach by a printed Book is an argument of Igno- " rance and Incapacity*; which is no leſs trifling " than the former. He, indeed (if any ſuch " there be) who is afraid his Scholars will im- " prove too faſt, will, undoubtedly, decry this " method: But that Maſter's ignorance can " never be brought in queſtion, who can begin " and end it readily; and, moſt certainly, that " ſcholar's non-improvement can be as little " queſtioned, who makes a much greater pro- " greſs by this than by the common method."

To enter into a long detail of every Rule, would tire the reader, and ſwell the Preface to an unuſual length; I ſhall, therefore, only give a general idea of the method of proceeding, and leave the reſt to ſpeak for itſelf; which, I hope, the kind reader will find to anſwer the title, and the recommendation given it. As to the Rules, they follow in the ſame manner as the table of contents ſpecifies, and in much the ſame order as they are generally taught in

Schools. I have gone through the four fundamental rules in Integers firſt, before thoſe of the ſeveral denominations: in order that they being well underſtood, the latter will be performed with much more eaſe and diſpatch, according to the rules ſhewn, than by the cuſtomary method of dotting. In Multiplication I have ſhewn both the beauty and uſe of that excellent Rule, in reſolving moſt Queſtions that occur in merchandizing; and have prefixed before Reduction, ſeveral Bills of Parcels, which are applicable to real buſineſs. In working Intereſt by Decimals, I have added Tables to the Rules, for the readier calculating Annuities, *&c.* and have not only ſhewn the uſe, but the method, of making them. I have alſo added to this *Edition* a NEW RULE for extracting the *Cube Root*, being a much ſhorter way than any that is already publiſhed; as likewiſe an Intereſt-Table calculated for the eaſier finding the Intereſt of any Sum of Money at any Rate *per Cent.* by Multiplication and Addition only: It is alſo uſeful in calculating Rents, Incomes, and Servants Wages, for any number of Months, Weeks, or Days; and, I may venture to ſay, I have gone through the whole with ſo much plainneſs and perſpicuity, that there is none better extant.

I have

I have nothing further to add, but a return of my ſincere thanks to all thoſe Gentlemen, Schoolmaſters, and others, whoſe kind approbation and encouragement hath now eſtabliſhed the uſe of this Book in almoſt every School of eminence throughout the Kingdom: But I think my gratitude more eſpecially due to thoſe who have favoured me with their remarks; though, I muſt ſtill beg of every candid and judicious Reader, that if he ſhould, by chance, find a tranſpoſition of a Letter, or a falſe Figure, to excuſe it; for, notwithſtanding there has been great care taken in correcting, yet errors of the Preſs will inevitably creep in; and ſome may alſo have ſlipped my obſervation: In either of which caſes, the Admonition of a good-natured Reader will be very acceptable to his

much obliged,

and moſt obedient

humble Servant,

Great Ruſſel-Street,
Bloomſbury.

F. WALKINGAME.

CONTENTS.

PART I.

ARITHMETIC *in* WHOLE NUMBERS.

	Page
INTRODUCTION	1
Numeration	2
Integers, Addition	3
——— *Subtraction*	4
——— *Multiplication*	5
——— *Division*	7
Tables	9
Addition of several Denominations	16
——— *Subtraction*	20
——— *Multiplication*	23
——— *Division*	26
Bills of Parcels	28
Reduction	31
Single Rule of Three Direct	42
——— *Inverse*	45
Double Rule of Three	47
Practice	48
Simple Interest	56
Commission	57
Purchasing of Stocks	57
Brokage	59
Compound Interest	64
Rebate or Discount	65
Equation of Payments	66
Barter	68
Profit and Loss	69
Fellowship	71
——— *with Time*	73
Alligation Medial	74
——— *Alternate*	76
Position, or Rule of False	80
——— *Double*	81
Exchange	83
Comparison of Weights and Measures	87
Conjoin'd Proportion	88
Progression Arithmetical	89
——— *Geometrical*	92
Permutation	96

CONTENTS.

PART II.

VULGAR FRACTIONS.

	Page
Reduction	98
Addition	104
Subtraction	ib.
Multiplication	105
Division	106
The Rule of Three Direct	107
——— *Inverse*	108
The double Rule of Three	ib.

PART III.

DECIMALS.

	Page
Numeration	109
Addition	110
Subtraction	111
Multiplication	ib.
Contracted Multiplication	112
Division	113
——— *Contracted*	114
Reduction	115
Decimal Tables of Coin, Weights and Measures	118
The Rule of Three	121
Extraction of the Square Root	122
——— *Vulgar Fractions*	123
——— *Mixed Numbers*	ib.
Extraction of the Cube Root	127
——— *Vulgar Fractions*	129
——— *Mixed Numbers*	ib.
——— *Biquadrate Root*	131
A general Rule for extracting the Root of all Powers	131
Simple Interest	133
——— *for Days*	134
Annuities and Pensions, &c. in Arrears	137
Present Worth of Annuities	140
Annuities, &c. in Reversion	143
Rebate or Discount	145
Equation of Payments	147
Compound Interest	148
Annuities, &c. in Arrears	151
Present Worth of Annuities	154
Annuities, &c in Reversion	156
Purchasing Freehold or Real Estates	158
——— *in Reversion*	159
Rebate or Discount	160

CONTENTS.

PART IV.

DUODECIMALS.

	Page
Multiplication of Feet and Inches - -	163
Measuring by the Foot Square - - -	165
Measuring by the Yard Square - - -	ib.
Measuring by the Square of 100 *Feet* -	166
Measuring by the Rod -	167
Multiplying several Figures by several, and the Operation in one Line only -	168

PART V.

QUESTIONS.

	Page
A Collection of Questions set down promiscuously, for the greater Trial of the foregoing Rules -	169
A general Table for calculating Interests, Rents, Incomes, and Servants Wages.	178

Explanation *of the* Characters *made uſe of in this* COMPENDIUM.

= *Equal.*	The Sign of Equality; as, 4 qrs. = 1 cwt. ſignifies, that 4 qrs. are equal to 1 cwt.
—*Minus or leſs.*	The Sign of Subtraction; as, 8 — 2 = 6, that is 8 leſſened by 2 is equal to 6.
+ *Plus or more.*	The Sign of Addition; as, 4 + 4 = 8, that is, 4 add 4 more is equal to 8.
× *Into or with.*	The Sign of Multiplication; as, 4 × 6 = 24 that is 4 multiplied into 6 is equal to 24.
÷ *By*	The Sign of Diviſion; as, 8 ÷ 2 = 4, that is, 8 divided by 2 is equal to 4.
$\frac{2357}{63}$	Numbers placed like a Fraction do likewiſe denote Diviſion; the upper Number being the Dividend, and the lower the Diviſor.
: : *So is.*	The Sign of proportion; as, 2 : 4 : : 8 : 16, that is, as 2 is to 4 ſo is 8 to 16.
7—2+5=10	Shews that the Difference between 2 and 7 added to 5 is equal to 10.
$\overline{2-2+5}=2$	Signifies, that the Sum of 2 and 5 taken from 9 is equal to 2.
$\surd$	Prefixed to any number, ſignifies the Square Root of that number is required.
$\surd^3$	Signifies the Cube, or third Power.
$\surd^4$	Denotes the Biquadrate, or the fourth Power, *&c.*

THE

THE TUTOR's ASSISTANT;

BEING

A COMPENDIUM OF ARITHMETIC.

PART I.

Arithmetic in Whole Numbers.

THE INTRODUCTION.

ARITHMETIC is the Art or Science of computing by Numbers, and conſiſts both in Theory and Practice.

The Theory conſiders the Nature and Quality of Numbers, and demonſtrates the Reaſon of practical Operations.

The practice is that which ſhews the Method of working by Numbers, ſo as to be the moſt uſeful and expeditious for Buſineſs, and has five principal or fundamental Rules for the Operations: *viz.*

NOTATION or NUMERATION, ADDITION, SUBTRACTION, MULTIPLICATION, and DIVISION.

NUMERATION

TEACHETH the different Value of Figures by their different Places, and to read and write any Sum or Number.

The TABLE.

C Millions.	X Millions.	Millions.	C Thouſands.	X Thouſands.	Thouſands.	Hundreds.	Tens.	Units.
9	8	7	. 6	5	4	. 3	2	1
9	0	0	. 0	0	0	. 0	0	0
	8	0	. 0	0	0	. 0	0	0
		7	. 0	0	0	. 0	0	0
			6	0	0	. 0	0	0
				5	0	. 0	0	0
					4	. 0	0	0
						3	0	0
							2	0
								1

RULE. There are three Periods; the Firſt, on the Right-Hand, Units; the Second, Thouſands; and the Third, Millions; each conſiſting of three Figures or Places. Reckon the firſt Figure of each from the Left Hand as ſo many Hundreds, the next as Tens, and the Third as ſo many ſingle Ones of what is wrote over them: As the firſt Period on the Left Hand is read thus, Nine Hundred Eighty-ſeven Millions; and ſo on for any of the reſt.

The APPLICATION.

Write down in proper Figures the following Numbers.

Twenty-three.

Two Hundred and Fifty-four.

Three Thouſand, two Hundred and Four.

Twenty-five Thouſand, Eight Hundred Fifty-ſix.

One Hundred Thirty-two Thouſand, two Hundred Forty five.

Four Millions, nine hundred forty-one Thouſand, four Hundred.

Twenty-ſeven Millions, one hundred fifty-ſeven Thouſand, eight-hundred, thirty-two.

Seven hundred twenty-two Millions, two hundred thirty-one Thouſand, five Hundred and Four.

Six hundred two Millions, two hundred ten Thouſand, five Hundred.

Write

Write down in Words at Length the following Numbers.

35	2017	519007	5207054	65700047
59	5201	750058	2071909	900061057
173	20760	5900030	70054008	201900790

Notation by ROMAN *Letters.*

I One.
II Two.
III Three.
IV Four.
V Five.
VI Six.
VII Seven.
VIII Eight.
IX Nine.
X Ten
XI Eleven.
XII Twelve.
XIII Thirteen.
XIV Fourteen.
XV Fifteen.
XVI Sixteen.
XVII Seventeen.
XVIII Eighteen.
XIX Nineteen.
XX Twenty.
XXX Thirty.
XL Forty.
L Fifty.
LX Sixty.
LXX Seventy.
LXXX Eighty.
XC Ninety.
C Hundred.
CC Two Hundred.
CCC Three Hundred.
CCCC Four Hundred.
D Five Hundred.
DC Six Hundred.
DCC Seven Hundred.
DCCC Eight Hundred.
DCCCC Nine Hundred.
M One Thousand.
MDCCLXXVIII One Thousand, Seven Hundred and Seventy-eight.

INTEGERS.

ADDITION

TEACHETH to add two or more Sums together, to make one whole or total Sum.

RULE. There must be due Regard had in placing the Figures one under the other, *i. e.* Units under Units, Tens under Tens, *&c.* then beginning with the first Row of Units, add them up to the Top; when done, set down the Units, and carry the Tens to the next, and so on; continuing to the last Row, at which set down the total Amount.

PROOF. Begin at the Top of the Sum, and reckon the Figures downwards, the same as you added them up, and, if the same as the first, the Sum is supposed to be right.

ADDITION *and* SUBTRACTION TABLE.

1	2	3	4	5	6	7	8	9
2	4	5	6	7	8	9	10	11
3	5	6	7	8	9	10	11	12
4	6	7	8	9	10	11	12	13
5	7	8	9	10	11	12	13	14
6	8	9	10	11	12	13	14	15
7	9	10	11	12	13	14	15	16
8	10	11	12	13	14	15	16	17
9	11	12	13	14	15	16	17	18

£.	*Cwt.*	*Qrs.*	*Months.*	*£.*	*Years.*
2	27	275	1234	7524	27104
5	35	110	7098	3750	32547
7	47	473	3314	9147	10738
9	35	354	6732	3214	62590
2	41	271	2546	4725	75408
5	36	352	3709	2147	27973
4	59	471	4152	3254	85421
3	37	310	3705	2716	12706
7	14	473	1076	1047	10471
44	331				

SUBTRACTION

TEACHETH to take a leſs Number from a greater, and ſhews the Remainder, or Difference.

RULE. This being the Reverſe of Addition, you muſt borrow here (if it requires) what you ſtopped at there, always remembering to pay it to the next.

PROOF. Add the Remainder and leſs Line together, and if the ſame as the greater, it is right.

	£.	*Hund.*	*Hours.*	*Weeks.*	*Hogds.*	*Minutes.*
From	271	3754	42087	452705	271508	3750214
Take	154	2725	35096	327616	152471	2150873
Rem.	117					
Proof.	271					

MULTIPLICATION

TEACHETH how to encreaſe the greater of two Numbers given, as often as there are Units in the leſs; and compendiouſly performs the Office of many Additions.

To this Rule belong three principal Members: *viz.*

1, The Multiplicand, or Number to be multiplied:

2, The Multiplier, or Number by which you multiply:

3, The Product, or Number produced by multiplying.

RULE. Begin with that Figure that ſtands in the Unit's place of the Multiplier, and with it multiply the firſt Figure in the Unit's place of the Multiplicand. Set down the Units, and carry the Tens in Mind, till you have multiplied the next Figure in the Multiplicand by the ſame Figure in the Multiplier; to the Product of which add the Tens you kept in Mind, ſetting down the Units, and proceed as before, till the whole Line is multiplied.

PROOF. The uſual Way of proving Multiplication is, by caſting out the Nines from the Multiplicand and Multiplier; the Remainders put on each ſide of a Croſs; Multiply the Figures on each Side together, caſt the Nines from the Product, and put the Overplus at Top; then caſt out the Nines from the Product of the Multiplication, and its Remainder place at the Bottom; if it agrees with the Top, the Work is ſuppoſed right. But the ſureſt Way is, to divide the Product by the Multiplicand, and the Quotient will be the ſame as the Multiplier.

MULTIPLICATION *and* DIVISION TABLE.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

Multiplicand	25104736	52471021	7925437521
Multiplier	2	3	4
Product	50209472		

27104107	231047	7092516	3725104
5	6	7	8
3215406	2701047	31040171	35210472
9	11	12	12

When the Multiplier is more than 12, and leſs than 20, multiply by the Unit Figure in the Multiplier, adding to the Product the back Figure to that you multiplied.

5710592	5107252	7653210	92057165
13	14	15	16
6251721	9215324	2571341	3592104
17	18	19	19

When the Multiplier conſiſts of ſeveral Figures, there muſt be as many Products as there are Figures in the Multiplier, obſerving to put the firſt Figure of every Product under that Figure you multiply by. Add the ſeveral Products together, and their Sum will be the total Product.

0	271041	32104	2710432	27501976
640	27	25	375	271
0	1897287	802600	1016412000	7453035496
	512082			
	7318107			

When Cyphers are placed between the ſignificant Figures in the Multiplier, they may be omitted; but great Care muſt be taken that the next Figure muſt be put one Place more to the Left Hand, *i. e.* under the Figure you multiply by.

571204	7104325	5271094
27009	57020	590030
15427648836	405088611500	3110103592820

When there are Cyphers at the End of the Multiplicand or Multiplier, they may be omitted, by only multiplying by the reſt of the Figures, and ſetting down on the Right-Hand of the total Product as many Cyphers as were omitted.

27100	37950	265000	574000
5260	274000	7200	630
1425460000	10398300000	1908000000	361620000

When the Multiplier is a compoſite Number, *i. e.* if any two Figures, being multiplied together, will make that Number, then multiply by one of thoſe Figures, and that Product by the other will give the Anſwer.

771039 by 35	921563 by 32	715241 by 56
19986365	29490016	40053496

DIVISION

TEACHETH to find how often one Number is contained in another; or to divide any Number into what Parts you pleaſe.

In this Rule there are three Numbers real, and a fourth accidental: *viz.*

1, The Dividend, or Number to be divided:

2, The Diviſor, or Number by which you divide:

3, The Quotient, or Number that ſhews how often the Diviſor is contained in the Dividend:

4th, or accidental Number, is what remains when the Work is finiſhed, and is of the ſame Name as the Dividend.

RULE. When the Diviſor is leſs than 12, find how often it is contained in the firſt Figure of the Dividend; ſet it down under the Figure you divided, and carry the Overplus (if any) to the next in the Dividend, as ſo many Tens; then find how often the Diviſor is contained therein, ſet it down, and continue the ſame till you have gone through the

the Line: But when the Diviſor is more than 12, multiply it by the Quotient Figure; the Product ſubtract from the Dividend, and to the Remainder bring down the next Figure in the Dividend, and proceed as before, till the Figures are all brought down.

PROOF. Multiply the Diviſor and Quotient together, adding the Remainder (if any) and the Product will be the ſame as the Dividend.

	Dividend	Rem.				
Diviſor	2)725107(	1	3)7210472(		4)7210416(	
Quotient	362553					
	2		5)7203287(		6)5231047(	
Proof	725107					
	7)2532701(		8)2547325(		9)25047306(	
	11)2750012(		11)2710513(		12)72100732(	

Diviſor	Dividend	Quotient		
29)4172377(		143875		
29		29		
127		1294875	37)7210473(	194877
116		287750	473)2104721(	4449
112		2 Rem.	275)3720147(	13527
87	4172377	Proof	3701)72109521(	19483
253			3576)72104725(	20163
232			2510)63210476(	25183
217			25204)321047217(	12737
203			31709)521047321(	16432
147			2701234)7210472532(	2669
145			210472)352107193214(	1672940
Rem.	2		3721071)2107192147	3(5662

When

When there are Cyphers at the End of the Diviſor, they may be cut off, and as many Places from off the Dividend, but muſt be annexed to the Remainder at laſt.

271|00)254732|21(939 5721|00)7253472|16(1267
373|000)752473|719(2006 215|000)6325104|997(29419

When the Diviſor is a compoſite Number, (*i. e.* if any two Figures, being multiplied together, will make that Number) then, by dividing the Dividend by one of thoſe Figures, and that Quotient by the other, it will give the Quotient required.—But as it ſometimes happens, that there is a Remainder to each of the Quotients, and neither of them the true one, it may be found by this

RULE. Multiply the firſt Diviſor into the laſt Remainder, to that Product add the firſt Remainder, which will give the true one.

Div. 3210473 by 27	7210473 by 35	6251043 by 42	5761034 by 54
118906.11Rem.	206313.18Rem.	148834 15Rem.	106685.44Rem.

MONEY.

Marked			Marked
¼ *Farthing.*	4 Farthings make	1 Penny.	*d.*
½ *Halfpenny.*	12 Pence	1 Shilling	*s.*
¾ *Three Farthings.*	20 Shillings	1 Pound.	*l.*

Farthings.
4 = 1 Penny.
48 = 12 = 1 Shilling.
960 = 240 = 20 = Pound.

Shillings.

s.		*£.*	*s.*
20	-	1	0
30	-	1	10
40	-	2	0
50	-	2	10
60	is	3	0
70	-	3	10
80	-	4	0
90	-	4	10
100	-	5	0

PENCE TABLE.

d.		*s.*	*d.*	*d.*		*s.*	*d.*
20	-	1	8	90	-	7	6
24	-	2	0	96	-	8	0
30	-	2	6	100	-	8	4
36	-	3	0	108	-	9	0
40	-	3	4	110	-	9	2
48	is	4	0	120	is	10	0
50	-	4	2	130	-	10	10
60	-	5	0	132	-	11	0
70	-	5	10	140	-	11	8
72	-	6	0	144	-	12	0
80	-	6	8	150	-	12	6
84	-	7	0				

TROY

TROY WEIGHT.

			Marked
24 Grains	make	1 Pennyweight.	*grs.* *dwts.*
20 Pennyweights		1 Ounce	*oz.*
12 Ounces		1 Pound	*lb.*

Grains.
24 = 1 Pennyweight.
480 = 20 = 1 Ounce.
5760 = 240 = 12 = 1 Pound.

By this Weight are weighed Gold, Silver, Jewels, Electuaries, and all Liquors.

N. B. The Standard for Gold Coin is 22 Carats of fine Gold, and 2 Carats of Copper, melted together. For Silver, is 11 *oz.* 2 *dwts.* of fine Silver, and 18 *dwts.* of Copper.

25 *lb.* is a Quarter of an *cwt.* 100 *lb.* 1 *cwt.*
20 *cwt.* 1 Ton of Gold or Silver.

AVOIRDUPOISE WEIGHT.

			Marked
16 Drams	make	1 Ounce.	*dr.* *oz.*
16 Ounces		1 Pound.	*lb.*
28 Pounds		1 Quarter.	*qrs.*
4 Quarters, or 112 *lb.*		1 Hundred Weight	*cwt.*
20 Hundred Weight		1 Ton	*Ton.*

Drams.
16 = 1 Ounce.
256 = 16 = 1 Pound.
7168 = 448 = 28 = 1 Quarter.
28672 = 1792 = 112 = 4 = 1 Hund. Weight.
573440 = 35840 = 2240 = 80 = 20 = 1 Ton.

There are several other Denominations in this Weight, that are used in some particular Goods: *viz.*

	lb.		*lb.*
A Firkin of Butter	56	A Stone of Iron Shot, or Horseman's wt.	14
Soap	94	Butcher's Meat	8
A Barrel of Anchovies	30	A Gallon of Train Oil	7½
Soap	256	A Truss of Straw	36
Raisins	112	New Hay	60
A Puncheon of Prunes	1120	Old Hay	56
A Fother of Lead, 19 *cwt.* 2 *qrs.*		36 Trusses a Load.	

Cheese

Cheese and Butter.

A Clove, or Half Stone, 8*lb.*

	lb.		*lb.*
A Wey in Suffolk, 32 Cloves, or	256	A Wey in Essex, 42 Cloves, or	336

Wool.

	lb.		*lb.*
A Clove - — — —	7	A Wey is 6 Tod and 1 Stone, or —	182
A Stone - — — —	14	A Sack is 2 Weys, or	364
A Tod - — — —	28	A Last is 12 Sacks, or	4368

By this Weight is weighed any Thing of a coarse or drossy Nature; as all Grocery and Chandlery Wares; Bread and all Metals but Silver and Gold.

Note, 1 Pound Avoirdupoise is equal to 14 *oz.* 11 *dwts.* 15 *gr.* $\frac{1}{2}$ Troy.

APOTHECARIES WEIGHT.

		Marked
20 Grains - make - -	1 Scruple. - - - - -	℈
3 Scruples - - - - -	1 Dram - - - - -	ʒ
8 Drams - - - - - -	1 Ounce - - - -	℥
12 Ounces - - - - -	1 Pound. - - - -	℔

Grains.

20 = 1 Scruple.
60 = 3 = 1 Dram.
480 = 24 = 8 = 1 Ounce.
5760 = 288 = 96 = 12 = 1 Pound.

Note, The Apothecaries mix their Medicines by this Rule, but buy and sell their Commodities by Avoirdupoise Weight.

The Apothecaries Pound and Ounce, and the Pound and Ounce Troy are the same, only differently divided and subdivided.

CLOTH MEASURE.

		Marked
4 Nails - make - - -	1 Quarter of a Yard.	*n.* *qrs.*
3 Quarters - - - -	1 Flemish Ell. - -	*F. E.*
4 Quarters - - - -	1 Yard. - - - - -	*yd.*
5 Quarters - - - -	1 English Ell. - -	*E. E.*
6 Quarters - - - -	1 French Ell. - -	*Fr. E.*

Inches.

Inches.

2 = 1 Nail.
9 = 4 = 1 Quarter.
36 = 16 = 4 = 1 Yard.
27 = 12 = 3 = 1 Flemish Ell.
45 = 20 = 5 = 1 English Ell.

LONG MEASURE.

		Marked
3 Barley Corns - make -	1 Inch - - - - -	*bar.* *in.*
12 Inches - - - - - -	1 Foot. - - - - - -	*feet.*
3 Feet - - - - - - -	1 Yard. - - - - -	*yd.*
6 Feet - - - - - - -	1 Fathom. - - - -	*fth.*
5½ Yards - - - - - -	1 Rod, Pole, or Perch.	*rod. p.*
40 Poles - - - - - -	1 Furlong. - - - -	*fur.*
8 Furlongs - - - - -	1 Mile. - - - - -	*mile.*
3 Miles - - - - - -	1 League. - - - -	*lea.*
60 Miles - - - - - -	1 Degree. - - - -	*deg.*

Barley Corns.

3 = 1 Inch.
36 = 12 = 1 Foot.
108 = 36 = 3 = 1 Yard.
594 = 198 = 16½ = 5½ = 1 Pole.
23760 = 7920 = 660 = 220 = 40 = 1 Furlong.
190080 = 63360 = 5280 = 1760 = 320 = 8 = 1 Mile.

N. B. A Degree is 69 Miles, 4 Furlongs, nearly, tho' commonly reckoned but 60 Miles.

This Measure is used to measure Distance of Places, or any Thing else that has length only.

WINE MEASURE.

		Marked
2 Pints - make - - -	1 Quart. - - -	*pt.* *qts.*
4 Quarts - - - - -	1 Gallon. - - - -	*gal.*
10 Gallons - - - - -	1 Anchor of Brandy.	*anc.*
18 Gallons - - - - -	1 Runlet. - - - -	*run.*
31½ Gallons - - - - -	Half an Hogshead. -	½*hhd.*
42 Gallons - - - - -	1 Tierce. - - - -	*tierce.*
63 Gallons - - - - -	1 Hogshead. - - -	*hhd.*
2 Hogsheads - - - -	1 Pipe, or Butt. -	*P.* or *Butt.*
2 Pipes, or 4 Hogsheads -	1 Tun. - - - -	*tun.*

Cubic

Inches.

$28\frac{7}{8}$ = 1 Pint.
$57\frac{3}{4}$ = 2 = 1 Quart.
231 = 8 = 4 = 1 Gallon.
9702 = 336 = 168 = 42 = 1 Tierce.
14553 = 504 = 252 = 63 = $1\frac{1}{2}$ = 1 Hogſhead.
19404 = 672 = 336 = 84 = 2 = $1\frac{1}{3}$ = 1 Puncheon.
29106 = 1008 = 504 = 126 = 3 = 2 = $1\frac{1}{2}$ = 1 Pipe.
58212 = 2016 = 1008 = 252 = 6 = 4 = 3 = 2 = 1 Tun.

All brandies, ſpirits, perry, cyder, mead, vinegar, honey, and oil, are meaſured by this meaſure; as alſo milk: not by law, but cuſtom only.

ALE *and* BEER MEASURE.

2 Pints - - make - -	1 Quart.	*pts.* *qts.*
4 Quarts - - - - - -	1 Gallon. - - -	*gal.*
8 Gallons, - - - - - -	1 Firkin of Ale. -	*A. fir.*
9 Gallons, - - - - - -	1 Firkin of Beer. -	*B. fir.*
2 Firkins, - - - - - -	1 Kilderkin. - -	*Kil.*
4 Firkins, or 2 Kilderkins,	1 Barrel. - - -	*Bar.*
1 Barrel and $\frac{1}{2}$, or 54 Gall.	1 Hogſhead of Beer.	*hhd.*
2 Barrels - - - - - -	1 Puncheon. - -	*pun.*
3 Barrels, or 2 Hogſheads,	1 Butt. - - - -	*Butt.*

BEER.

Cubic Inches.

$35\frac{1}{4}$ = 1 Pint.
$70\frac{1}{2}$ = 2 = 1 Quart.
282 = 8 = 4 = 1 Gallon.
2538 = 72 = 36 = 9 = 1 Firkin.
5076 = 144 = 72 = 18 = 2 = 1 Kilderkin.
10152 = 288 = 144 = 36 = 4 = 2 = 1 Barrel.
15228 = 432 = 216 = 54 = 6 = 3 = $1\frac{1}{2}$ = 1 Hogſhead.
20304 = 576 = 288 = 72 = 8 = 4 = 2 = 1 Puncheon.
30456 = 864 = 432 = 108 = 12 = 6 = 3 = 2 = 1 Butt.

ALE.

Cubic Inches.

$35\frac{1}{2}$ = 1 Pint.
$70\frac{1}{2}$ = 2 = 1 Quart.
282 = 8 = 4 = 1 Gallon.
2256 = 64 = 32 = 8 = 1 Firkin.
4512 = 128 = 64 = 16 = 2 = 1 Kilderkin.
9024 = 256 = 128 = 32 = 4 = 2 = 1 Barrel.
13536 = 384 = 192 = 48 = 6 = 3 = $1\frac{1}{2}$ = 1 Hogſhead.

In *London* they compute but 8 gallons to the firkin of ale, and 32 to the barrel; but in all other parts of *England*, for ale, ſtrong beer, and ſmall, 34 gallons to the barrel, and 8 gallons and ½ to the firkin.

N. B. A barrel of ſalmon or eels, is - 42 gallons.
A barrel of herrings, - - - 32 gallons.
A keg of ſturgeon, - - - 4 or 5 gallons.
A firkin of ſoap, - - - - 8 gallons.

DRY MEASURE.

			Marked
2 Pints,	make	1 Quart.	*pts.* *qts.*
2 Quarts,		1 Pottle.	*pt.*
2 Pottles,		1 Gallon.	*gal.*
2 gallons,		1 Peck.	*pk.*
4 Pecks,		1 Buſhel.	*bu.*
2 Buſhels		1 Strike.	*ſtrike.*
4 Buſhels,		1 Coom.	*coom.*
2 Cooms, or 8 Buſhels,		1 Quarter.	*qr.*
4 Quarters,		1 Chaldron.	*chal.*
5 Quarters,		1 Wey.	*wey.*
2 Weys,		1 Laſt.	*laſt.*

In *London* 36 Buſhels make a Chaldron.

Solid Inches.

268⅘ = 1 Gallon.
537⅕ = 2 = 1 Peck.
2150⅖ = 8 = 4 = 1 Buſhel.
4300⅘ = 16 = 8 = 2 = 1 Strike.
8601⅓ = 32 = 16 = 4 = 2 = 1 Coom.
17203⅓ = 64 = 32 = 8 = 4 = 2 = 1 Quarter.
86106 = 320 = 160 = 40 = 20 = 10 = 5 = 1 Wey.
172032 = 640 = 320 = 80 = 40 = 20 = 10 = 2 = 1 Laſt.

The Buſhel in *Water-meaſure* is 5 Pecks.

A ſcore of coals, - is - 21 chaldron.
A ſack of coals, - - - - 3 buſhels.
A chaldron of coals, - - 12 ſacks.
A load of corn, - - - - 5 buſhels.
A cart load, ditto, - - - 40 buſhels.

This meaſure is applied to all dry goods.

The ſtandard buſhel is 18 inches and ½ wide, and 8 inches deep.

TIME

TIME.

				Marked
60 Seconds	make	1 Minute		"
60 Minutes		1 Hour		*hour.*
24 Hours		1 Day		*day.*
7 Days		1 Week		*week.*
4 Weeks		1 Month		*mo.*
13 Months, 1 day, 6 hours		1 Julian year		*yr.*

Seconds.

60 = 1 Minute.
3600 = 60 = 1 Hour.
86400 = 1440 = 24 = 1 Day.
604800 = 10080 = 168 = 7 = 1 Week.
2419200 = 40320 = 672 = 28 = 4 = 1 Month.

d h w d h
31557600 = 525960 = 8766 = 365.6 = 52.1.6 = 1 Julian yr.

d h m "
31556937 = 525948 = 8765 = 365.5.48.57 = 1 Solar yr.

To know the days in each month, observe,

Thirty days hath September,
April, June, *and* November:
February *hath twenty eight alone,*
All the reſt hath thirty-and-one;
Except in Leap-Year, *and then's the time,*
February's *days are twenty-and-nine.*

SQUARE MEASURE.

144 Inches	make	1 Foot.	
9 Feet		1 Yard.	
100 Feet		1 Square of flooring,	
272¼ Feet		1 Rod.	
40 Rods		1 Rood.	
4 Roods, or 160 rods, or 4840 yards		1 Acre of land.	
640 Acres		1 Square mile.	
30 Acres		1 Yard of Land.	
100 Acres		1 Hide of land.	

Inches.

144 = 1 Foot.
1296 = 9 = 1 Yard.
39204 = 272¼ = 30¼ = 1 Pole.
568160 = 10890 = 1210 = 40 = 1 Rood.
6272640 = 43560 = 4840 = 160 = 4 = 1 Acre.

By this meaſure are meaſured all things that have length and breadth; ſuch as land, painting, plaiſtering, flooring, thatching, plumbing, glazing, &c.

SOLID MEASURE.

1728 Inches - make - 1 Solid foot.
27 Feet - - - - - 1 Yard, or load of earth.
40 Feet of round timber, } is 1 ton or load.
Or, 50 Feet of hewn timber }

108 Solid feet, *i. e.* 12 feet in length, 3 feet in breadth, and 3 deep; or, commonly, 14 feet long, 3 feet 1 inch broad, and 3 feet 1 inch deep, is a ſtack of wood.

128 Solid feet, *i. e.* 8 feet long, 4 feet broad, and 4 feet deep, is a cord of wood.

By this meaſure are meaſured all things that have length, breadth, and depth.

ADDITION *of* MONEY, WEIGHTS, *and* MEASURES.

RULE. Add the firſt row or denomination together, as in integers; then divide the ſum by as many of the ſame denomination as make one of the next greater, ſetting down the remainder under the row added, and carry the quotient to the next ſuperior denomination, continuing the ſame to the laſt, which add as in ſimple Addition.

MONEY.

£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.
2	13	5½	27	7	2	35	17	3	75	3	7
7	9	4¼	34	14	7¼	59	14	7½	54	17	1½
5	15	4½	57	19	2¼	97	13	5¼	91	15	4¼
9	17	6¼	91	16	1	37	16	8¼	35	16	5¾
7	16	3	75	18	7¾	97	15	7	29	19	7¼
5	14	7¾	97	13	5	59	16	5½	91	17	3½
39	6	7¼									

MONEY.

£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.
257	1	5½	525	2	4¼	21	14	7¼	73	2	1½
734	3	7¾	179	3	5	75	16	3	25	12	7
595	5	3	250	4	7¼	79	2	4¼	96	13	5½
059	14	7½	975	3	5¼	57	16	5½	76	17	3¼
207	5	4	254	5	7	26	13	8¾	97	14	1
798	16	7¼	379	4	5¾	54	2	7	54	13	7¾

172	4	7¼	251	17	1¼	25	1	1½	27	13	5
325	3	5	379	13	5	76	13	1	16	7	9¼
271	—	5	257	16	7¾	34	19	7¼	9	15	3
524	9	1	184	13	5	97	17	3¼	15	2	7¼
379	4	3½	725	2	7¼	35	13	5	37	19	1
215	5	1¾	359	6	5¼	27	16	3	56	10	7¾

TROY WEIGHT.

oz.	dwt.	gr.	oz.	dwt.	gr.	lb.	oz.	dwt.	lb.	oz.	dwt.
7	15	21	5	11	4	7	1	2	5	2	15
3	17	6	7	19	21	3	2	17	3	11	17
2	5	15	3	15	14	5	1	15	9	7	15
3	16	19	7	19	22	7	10	11	3	1	13
9	18	23	9	18	15	2	7	13	3	9	7
7	15	14	8	13	12	3	11	15	5	2	15

AVOIRDUPOISE WEIGHT.

lb.	oz.	dr.	lb.	oz.	dr.	cwt.	qrs.	lb.	T.	cwt.	qrs.
152	15	15	17	12	3	25	1	17	7	17	2
272	14	10	23	15	6	72	3	26	5	5	3
303	15	11	31	11	14	54	1	16	2	4	—
255	10	4	97	—	9	24	4	16	3	18	2
973	6	2	48	7	15	17	—	19	7	9	3
635	13	13	79	10	6	55	2	16	8	5	1

APOTHECARIES WEIGHT.

℥	ʒ	℈	gr.	℥	ʒ	ʒ	℈	gr.	lb	℥	ʒ	℈	lb	℥	ʒ	℈
7	1	1	17	9	2	—	1	17	7	10	7	1	7	2	1	—
3	—	1	18	3	5	2	1	19	9	5	2	2	3	1	7	1
6	2	1	16	9	2	1	1	14	7	11	1	2	9	10	2	—
5	1	1	15	3	5	—	1	18	9	5	6	1	7	5	7	1
7	—	1	18	7	7	2	1	15	7	10	5	2	3	9	5	2
3	1	1	9	3	3	—	—	—	9	—	3	—	7	1	4	1

CLOTH MEASURE.

EF.	*qrs.*	*n.*	*yds.*	*qrs.*	*n.*	*yds.*	*qrs.*	*n.*	*EE.*	*qrs.*	*n.*
27	2	1	35	3	2	73	3	2	72	2	1
15	8	3	70	2	3	97	1	3	52	1	2
37	—	2	95	3	—	54	—	2	79	—	1
52	1	3	76	1	3	76	2	—	56	2	—
76	2	1	26	—	1	59	1	3	79	3	1
97	1	3	79	2	1	76	2	2	54	2	1

LONG MEASURE.

feet.	*in.*	*bar.*	*yds.*	*feet.*	*in.*	*m.*	*fur.*	*p.*	*lea.*	*m.*	*fur.*
27	9	2	25	1	9	35	7	3	72	2	1
35	10	1	71	—	3	27	5	27	27	1	7
17	2	3	52	8	3	52	—	35	35	2	5
35	11	1	97	—	10	97	1	17	79	—	6
97	2	2	54	2	7	56	7	18	51	1	6
54	8	1	37	1	4	91	5	27	72	—	5

LAND MEASURE.

a.	*r.*	*p.*	*a.*	*r.*	*p.*	*a.*	*r.*	*p.*	*a.*	*r.*	*p.*
75	3	27	27	1	35	26	1	31	32	1	14
36	2	15	29	2	19	19	2	17	27	—	19
97	1	16	37	1	15	55	3	14	31	2	15
35	2	15	95	2	27	79	1	21	19	1	18
27	1	14	62	—	13	95	2	14	39	2	37

WINE MEASURE.

run.	*gal.*	*qts.*	*tier.*	*gal.*	*qts.*	*hhds.*	*gal.*	*qts.*	*T.*	*hhds.*	*gal.*
27	17	2	25	36	2	31	57	1	14	3	27
35	15	3	75	41	3	97	18	2	19	2	56
56	14	1	62	15	1	76	13	1	17	—	39
97	10	3	94	13	—	55	46	2	75	2	16
92	15	—	15	14	1	87	38	3	54	1	19
79	3	1	19	17	2	54	17	1	97	3	54

ALE *and* BEER MEASURE.

A.B.fir.	*gal.*	*B.B fir.*	*gal.*	*hhd.*	*gal.*	*qt.*	*hhd.*	*gal.*	*qt.*
25	2	7	37	2	8	76	51	2	76	2	1
17	3	5	54	1	7	57	3	3	95	34	2
96	2	9	97	3	8	97	27	3	57	16	3
75	1	4	78	2	5	54	17	2	2	14	1
96	3	7	47	—	7	97	19	3	32	37	3
75	—	5	35	2	5	56	38	—	55	16	1

DRY MEASURE.

qr.	*bu.*	*p.*	*qr.*	*bu.*	*p.*	*ch.*	*bu.*	*p.*	*ch.*	*bu.*	*p.*
75	7	2	36	2	1	75	27	2	73	2	1
37	2	3	71	—	3	57	3	1	41	24	1
51	2	—	53	6	—	95	25	3	92	16	1
79	7	1	82	4	1	76	35	2	73	13	2
55	—	3	95	3	3	97	25	1	54	17	3
96	2	1	78	2	1	75	16	3	79	25	1

TIME.

hs.	*m.*	*″*	*d.*	*h.*	*m.*	*w.*	*d.*	*h.*	*w.*	*d.*	*h.*
52	57	35	72	23	27	71	3	11	57	2	15
97	16	27	54	14	35	51	2	9	95	3	21
16	58	45	97	13	21	76	—	21	76	—	15
96	18	31	58	21	45	95	3	21	53	2	21
75	35	21	96	20	48	79	1	15	98	—	18

The APPLICATION.

1. A man born in the year 1750, when will he be 47 years of age? *Anſ.* 1797.

2. *A*, *B*, *C*, *D*, went partners in the purchaſe of a quantity of goods; *A* laid out £7, half a guinea, and a crown, *B* 49*s*. *C* 54*s*. 6*d*. and *D* 87*d*. what was laid out in all?
Anſ. £13 .. 6 .. 3.

3. A man lent his friend at different times theſe ſeveral ſums, *viz.* £63, £25 .. 15, £32 .. 7, £15 .. 14 .. 10, and fourſcore and nineteen pounds, half a guinea, and a ſhilling. How much did he lend in all? *Anſ.* £236 .. 8 .. 4.

4. What's the eſtate worth *per annum*, when the taxes are 21 guineas, the neat income 8 ſcore, £19 .. 14?
Anſ. £201 .. 15.

5. There are three numbers; the firſt 215, the ſecond 519, and the third is as much as the other two, what is the ſum of them all? *Anſ.* 1468.

6. Bought a parcel of goods, for which I paid £54 .. 17, for packing 13*s*. 8*d*. carriage £1 .. 5 .. 4, and ſpent about the bargain 14*s*. 3*d*. What do theſe goods ſtand me in?
Anſ. £57 .. 10 .. 3.

7. There are two numbers, the leaſt whereof is 40, their difference 14. I deſire to know what is the greater number, and the ſum of both? *Anſ.* 54 *greater number* 94, *ſum.*

8. A gentleman left his eldeſt daughter £1500 more than the youngeſt, and her fortune was 11 thouſand, 11 hundred and 11£. What was the eldeſt ſiſter's fortune, and what did the father leave them?
Anſ. Eldeſt ſiſter's fortune £13611. *Father left them* £25722.

SUBTRACTION *of* MONEY, WEIGHTS *and* MEASURES.

RULE. Subtract as in Integers: only when any of the lower denominations are greater than the upper, borrow as many of that as make one of the next ſuperior, adding it to the upper, from which take the leſs; ſet down the difference, and carry 1 to the next lower denomination for what you borrowed.

PROOF. As in Integers.

MONEY.

	£.	s.	d.		£.	s.	d.
Borrowed	715	2	7¼	Lent	316	3	5½
Paid	476	3	8½	Received	218	2	1¾
Remains to pay	238	18	10¾				
Proof	715	2	7¼				

£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.
87	2	10	3	15	1½	25	2	5¼	37	3	4¾
79	3	7½	1	14	7	17	9	8½	27	5	2¼

£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.
329	17	1½	59	15	3¼	71	2	4	527	3	5½
257	14	7	36	17	2¼	19	13	7¾	139	5	7¼

Borrowed	25107	15	7	Lent	250156	1	6
Paid at different times	375	5	5¼	Received at several payments	271	13	7¼
	259	2	7½		359	15	3
	359	13	4¼		475	13	9¾
	523	17	3		527	15	3¼
	274	15	7¼		279	16	5
	325	13	5		150	—	—
Paid in all							
Remains to pay							

TROY WEIGHT.

	oz.	*dt.*	*gr.*	*oz.*	*dt.*	*gr.*	*lb.*	*oz.*	*dt.*	*gr.*	*lb.*	*oz.*	*dt.*	*gr.*
Bought	27	15	2	7	5	15	52	1	7	2	7	2	2	5
Sold	21	14	7	6	7	14	39	—	15	7	5	7	1	7
Unsold														

AVOIRDUPOISE WEIGHT.

lb.	*oz.*	*ar.*	*lb.*	*oz.*	*dr.*	*cwt.*	*qrs.*	*lb.*	*T.*	*cwt.*	*qrs.*	*lb.*
25	11	15	35	10	5	35	1	21	21	1	2	7
17	9	16	29	12	7	25	1	20	9	1	3	5

APOTHECARIES WEIGHTS.

℥	ʒ	℈	*gr.*	℥	ʒ	℈	*gr.*	℔	℥	ʒ	℈	℔	℥	ʒ	℈
27	1	–	1	3	1	2	4	5	2	1	–	9	7	2	1
15	2	–	7	1	–	–	7	2	5	2	1	5	7	3	1

CLOTH MEASURE.

E.F. qrs.	*n.*	*yds. qrs.*	*n.*	*yds. qrs.*	*n.*	*E.E. qrs.*	*n.*
35	2	2	47	1	–	71	1	2	35	2	1
17	2	1	35	2	2	3	2	1	14	3	2

LONG MEASURE.

f.	*in.*	*bar.*	*yds. f.*	*in.*	*m. fur.*	*p.*	*l. m.*	*f.*	*p.*
25	1	–	37	2	1	52	1	27	71	1	7	—
17	2	2	15	2	7	25	7	34	50	–	3	27

LAND MEASURE.

a.	*r.*	*p.*	*a.*	*r.*	*p.*	*a.*	*r.*	*p.*	*a.*	*r.*	*p.*
75	1	7	37	1	27	25	–	1	325	2	1
39	–	27	35	2	15	17	1	–	279	3	5

WINE MEASURE.

tun. gal.	*qts.*	*tier. gal.*	*qts.*	*hhd. gal.*	*qts.*	*tun. hhd.*	*gal.*
72	1	1	27	27	1	75	57	1	79	2	14
35	1	2	19	35	2	57	59	1	35	3	27

ALE *and* BEER MEASURE.

A.B. fir. gal.	*B.B. fir. gal.*	*hhd. gal. qts.*	*hhd. gal. qts.*
25 .. 1 .. 2	37 .. 2 .. 1	27 .. 27 .. 1	709 .. 2 .. 1
21 .. 1 .. 5	25 .. 1 .. 7	12 .. 50 .. 2	157 .. 2 .. 2

DRY MEASURE.

qu. bu.	*p.*	*qu. bu.*	*p.*	*ch. bu.*	*p.*	*ch. bu.*	*p.*
72	1	2	65	2	8	79	3	–	35	3	3
35	2	3	57	2	3	54	7	1	23	5	1

TIME.

h. m.	*"*	*d. h. m.*	*m. w. d.*	*m. w. d.*
75	1	27	72	1	51	35	2	1	65	2	1
52	7	31	36	3	27	17	3	5	14	1	1

The APPLICATION.

1. A man born in the year 1723, what was his age in the year 1778? *Anſ.* 55.

2. What is the difference between the age of a man born in 1710, and another born in 1766? *Anſ.* 56.

3. A merchant had five debtors, *A*, *B*, *C*, *D*, and *E*; which together owed him £1156; *B*, *C*, *D*, and *E*, owed him £737, what was *A*'s debt? *Anſ.* £419.

4. When an eſtate of £300. *per annum* is reduced, on paying of taxes, to 12 ſcore and £14 .. 6. what is the tax? *Anſ.* £45..14*s*?

5. What is the difference between 9154, and the amount of 754 added to 305? *Anſ.* 8095.

6. A horſe in his furniture is worth £37..5*s*. out of it 14 guineas: How much does the price of the furniture exceed that of a horſe? *Anſ.* £7..17.

7. A merchant, at his out-ſetting in trade, owed £750, he had in caſh, commodities, the ſtocks, and good debts, £12510..7; he cleared the firſt year by commerce, £452..3..5. What was the neat balance at the 12 months end? *Anſ.* £12212..10..5.

8. A gentleman dying left £45247. between two daughters; the youngeſt was to have 15 thouſand, 15 hundred, and twice £15. what was the elder ſiſter's fortune? *Anſ.* £28717.

MULTIPLICATION *of ſeveral* DENOMINATIONS.

RULE. Multiply the firſt denomination by the quantity given, dividing the product by as many of that as make one of the next, ſetting down the remainder, and add the quotient to the next ſuperior, after it is multiplied.

If the given quantity is above 12, multiply by any two numbers, which multiplied together, will make the ſame number; but if no two numbers multiplied together will make the exact number, then multiply the top line by as many as is wanting, adding it to the laſt product.

PROOF. By Diviſion.

£.	*s.*	*d.*	£.	*s.*	*d.*	£.	*s.*	*d.*	£.	*s.*	*d.*
35	12	$7\frac{1}{4}$	75	13	$1\frac{1}{2}$	62	5	$4\frac{1}{4}$	57	2	$4\frac{3}{4}$
		2			5			4			5
71	5	$2\frac{1}{2}$									

lb.	*oz.*	*dwt.*	*gr*	*ton.*	*cwt.*	*qrs.*	*lb.*	*yds.*	*n.*	*qrs.*	*m.*	*fur.*	*p.*
8	5	17	4	25	7	2	4	76	1	2	36	7	5
			7				8			2			5

a.	*r.*	*p.*	*A. B fir. gal.*	*B B. fir. gal.*	*m.*	*fur.*	*p.*
75	2	1	32 .. 1 .. 7	26 .. 2 .. 7	54	2	1
		9	7	3			5

1. 18 yds. of cloth, at 9*s.* 6*d* *per* yd.

9 × 2 = 18

9
4 .. 5 .. 6
2
8 .. 11 .. –

2. 26lb. of tea, at £1 .. 2 .. 6 *per* lb.

8 × 3 + 2 = 26

8
9 .. – .. –
3
27 .. – .. –
Top line × 2 2 .. 5 .. –
29 .. 5 .. –

3. 17 ells of holland, at 7*s.* 8*d.*½ *per* ell.
Facit £6..11..–½.
4. 35 firkins of butter, at 15*s.* 3*d.*½ *per* firkin.
Facit £26..15..2½.
5. 75 lb. of nutmegs, at 7*s.* 2*d.*¾ *per* lb.
Facit £27..2..2¼.
6. 37 yards of tabby, at 9*s.* 7*d.* *per* yard
Facit £17..14..7.
7. 97 cwt. of cheese, at £1..5..3. *per* cwt.
Facit £122..9. 3.
8. 43 doz. of candles, at 6*s.* 4*d.* *per* doz.
Facit £13..12..4.
9. 127 lb. of Bohea tea, at 12*s.* 3*d.* *per* lb.
Facit £77..15..9.
10. 135 gallons of rum, at 7*s.* 5*d.* *per* gallon.
Facit £50..1..3.
11. 74 ells of diaper, at 1*s.* 4*d.*½ *per* ell.
Facit £5..1..9.
12. 6 doz. pair of gloves, at 1*s.* 10*d.* *per* pair.
Facit £6..12.

When the given quantity consists of ½, ¼, divide the price by ½, ¼; when ¾, divide the price by ½, and that quotient by ½; which add to the product of the quantity given.

13. $25\frac{1}{2}$ ells of Holland, at 3*s*. 4*d*. $\frac{1}{2}$ *per* ell.

5 $\quad 5\times5=25$

16 .. $10\frac{1}{2}$

5

4 .. 4 .. $4\frac{1}{2}$ = 25
– .. 1 .. $8\frac{1}{4}$ = $\frac{1}{4}$

4 .. 6 .. $-\frac{3}{4}$ = $25\frac{1}{2}$

14. $75\frac{1}{2}$ ells of diaper, at 1*s*. 3*d*. *per* ell.
Facit £4 .. 14 .. $4\frac{1}{2}$.

15. $19\frac{1}{2}$ ells of damask, 4*s* 3 *d*. *per* ell.
Facit £4 .. 2 .. $10\frac{1}{2}$.

16. $35\frac{1}{2}$ ells of dowlass, at 1*s*. 4*d*. *per* ell.
Facit £ 2 .. 7 .. 4.

17. $7\frac{1}{4}$ cwt. of Malaga raisins, at £ 1 .. 1 .. 6. *per* cwt.
Facit £ 7 .. 15 .. $10\frac{1}{2}$.

18. $6\frac{1}{2}$ barrels of herrings, at £ 3 .. 15 .. 7. *per* barrel.
Facit £ 24 .. 11 .. $3\frac{1}{2}$.

19. $35\frac{1}{2}$ cwt. of double refined sugar, at £ 4 .. 15 .. 6. *per* cwt.
Facit £ 169 .. 10 .. 3.

20. $154\frac{1}{2}$ cwt. of tobacco, at £ 4 .. 17 .. 10. *per* cwt.
Facit £ 755 .. 15 .. 3.

21. $117\frac{1}{4}$ gallons of arrack, at 12*s*. 6*d*. *per* gallon.
Facit £ 73 .. 5 .. $7\frac{1}{2}$.

22. $85\frac{3}{4}$ cwt. of cheese, at £ 1 .. 7 .. 8 *per* cwt.
Facit £ 118 .. 12 .. 5.

23. $29\frac{1}{4}$ lb. of fine Hyson tea, at £ 1 .. 3 .. 6. *per* lb.
Facit £ 34 .. 7 .. $4\frac{1}{2}$.

24. $17\frac{3}{4}$ yds. of superfine scarlet drab, at £ 1 .. 3 .. 6. *per* yd.
Facit £ 20 .. 17 .. $1\frac{1}{2}$.

25. $37\frac{1}{2}$ yds. of rich brocaded silk, at 12*s*. 4*d*. *per* yd.
Facit £ 23 .. 2 .. 6.

26. $56\frac{3}{4}$ cwt. of sugar, at £ 2 .. 18 .. 7. *per* cwt.
Facit £ 166 .. 4 .. $7\frac{1}{4}$.

27. $56\frac{1}{2}$ cwt. of currants, at £ 2 .. 15 .. 6 *per* cwt.
Facit £ 167 .. 15 .. 9.

28. $45\frac{3}{4}$ lb. of Belladine silk, at 18*s*. 6*d*. *per* lb.
Facit £ 42 .. 6 .. $4\frac{1}{2}$.

29. 87 bushels $\frac{3}{4}$ of wheat, at 4*s*. 3*d*. *per* bushel.
Facit £ 18 .. 12 .. $11\frac{3}{4}$.

30. $120\frac{3}{4}$ cwt. of hops, at £ 4 .. 7 .. 6. *per* cwt.
Facit £ 528 .. 5 .. $7\frac{1}{2}$

The APPLICATION.

1. What ſum of money muſt be divided amongſt 18 men, ſo that each may receive £ 14 .. 6 .. 8½?

Anſ. £ 258 .. — .. 9.

2. A privateer of 250 men took a prize, which amounted to £ 125 .. 15 .. 6 to each man, what was the value of the prize? *Anſ.* £31443 .. 15 .. —.

3. What is the difference between 6 dozen dozen, and half a dozen dozen; and what is their ſum and product?

Anſ. 792, *Diff. Sum* 936, *Product* 62208.

4. What difference is there between twice eight and fifty, and twice fifty-eight, and what's their product?

Anſ. 50 *Diff.* 7656 *Prod.*

5. There are two numbers, the greater of them is 37 times 45, and their difference 19 times 4; their ſum and product are required? *Anſ.* 3254 *Sum*, 2645685 *Prod.*

6. The ſum of 2 numbers is 360, the leſs of them 144; what is their product, and the ſquare of their difference?

Anſ. 31104 *Product*, 5184 *Square of their Difference.*

7. If an army, conſiſting of 187 ſquadrons of horſe, each 157 men, and 207 battallions, each 560 men, how many effective ſoldiers, ſuppoſing that in 7 hoſpitals there are 475 ſick? *Anſ.* 144806.

8. What ſum did that gentleman receive in dowry with his wife, whoſe fortune was her wedding ſuit; her petticoat, having two rows of furbelows, each furbelow 87 quills, and each quill 21 guineas? *Anſ.* £ 3836 .. 14 .. —.

9. A merchant had £19118 to begin trade with: for 5 years together he cleared £1086 a-year; the next 4 years he made good £2715 .. 10 .. 6 a-year; but the laſt 3 years he was in trade, had the misfortune to loſe, one year with another, £475 .. 4 .. 6 a-year; what was his real fortune at 12 years end? *Anſ.* £33984 .. 8 .. 6.

DIVISION *of ſeveral* DENOMINATIONS.

RULE. Divide the firſt denomination on the left hand; and, if any remains, multiply them by as many of the next leſs as make one of that, which add to the next, and divide as before.

PROOF. by Multiplication.

£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.
2)25	.. 2	.. 4(	5)37	.. 3	.. 7(	4)57	.. 5	.. 7(	5)52	.. 7	.. 3(
12	.. 11	.. 2									

lb. oz. dwt. gr.	*lb. oz. dr.*	*T. cwt. qrs. lb.*
7)75 .. 3 .. 7 .. 5(	8)35 .. 14 .. 13(	6)5 .. 10 .. 1 .. 13(
yds. qrs. n.	*m. f. p.*	*yds. qrs. n.*
11)35 .. 1 .. 3(	9)76 .. 3 27(	12)75 .. 2 .. 9(
A.B. fir. gal.	*B.B. fir. gal.*	*ch. bu. pk.*
12)35 .. 2 .. 5(	9)55 .. 3 .. 7(	11)357 .. 2 1(

The APPLICATION.

1. If a man ſpends £257 .. 2 .. 5 in 12 months time, what is that *per* month? *Anſ.* £ 21 .. 8 .. 6¼.

2. The cloathing of 35 charity boys came to £57 .. 3 .. 7, what is the expence of each? *Anſ.* £1 .. 12 .. 8.

3. If I give £37 .. 6 .. 4¾ for 9 pieces of cloth, what did I give *per* piece? *Anſ.* £ 4 .. 2 .. 11.

4. If 20 cwt. of tobacco came to £ 27 .. 5 .. 4½, at what rate is that *per* cwt.? *Anſ.* £ 1 .. 7 .. 3.

5. What is the value of 1 hogſhead of beer, when 120 are ſold for £ 154 .. 17 .. 10? *Anſ.* £ 1 .. 5 .. 9¾

6. Bought 72 yards of cloth for £ 85 .. 6 .. –, I deſire to know at what rate *per* yard? *Anſ.* £ 1 .. 3.. 8½.

7. Gave £ 275 .. 3 .. 4 for 36 bales of cloth, what is that for 2 bales? *Anſ.* £ 15 .. 5 .. 8¾

8. A prize of £7257 .. 3 .. 6 is to be equally divided amongſt 500 ſailors, what is each man's ſhare?

Anſ. £ 14 .. 10 .. 3¼

9. There are 2545 bullocks to be divided among 509 men, I deſire to know how many each man had, and the value of each man's ſhare, ſuppoſing every bullock worth £9 .. 14 .. 6?

Anſ. 5 *bullocks each man* £ 48 .. 12 .. 6. *each ſhare.*

10. A gentleman has a garden walled in, containing 9625 yards, the breadth was 35 yards, what was the length? *Anſ.* 275.

11. A club in London, conſiſting of 25 gentlemen, joined for a lottery ticket of £10 value, which came up a prize of £ 4000, I deſire to know what each man contributed, and what each man's ſhare came to?

Anſ. each contributed 8*s. each ſhare* £160.

12. A trader cleared £1156 equally in 17 years, how much did he lay by in a year? *Anſ.* £68.

13. Another cleared £ 2805 in 7½ years, what was his yearly increaſe of fortune? *Anſ.* £ 374.

14. What number to the 43d part of 4429 will raiſe it to 240? *Anſ.* 137.

15. Divide 20*s.* between A, B, and C, in ſuch ſort that A may have 2*s.* leſs than B, and C, 2*s.* more than B?

Anſ. A. 4*s.* 8*d.* *B*, 6*s.* 8*d.* *C.* 8*s.* 8*d.*

16. If there are 1000 men to a regiment, and but 50 officers, how many private men are there to one officer?

Anſ. 19.

17. What number is that which multiplied by 7847 will make the product 3013248? *Anſ.* 384.

18. The quotient is 1083, the diviſor 28604, what was the dividend, if the remainder came out 1788?

Anſ. 30979920.

BILLS *of* PARCELS.

HOSIER'S.

Mr. John Thomas

Bought of Samuel Green, March 7, 1778.

		s.	*d.*		
8 Pair of woiſted ſtockings,	at	4 ..	6	*per* pair	£
5 Pair of thread ditto- -	at	3 ..	2	- - -	
3 Pair of black ſilk ditto -	at	14 ..	0	- - -	
6 Pair of milled hoſe - -	at	4 ..	2	- - -	
4 Pair of cotton ditto - -	at	7 ..	6	- - -	
2 Yards of fine flannel -	at	1 ..	8	- - -	

£7 .. 12 .. 2

MERCER'S.

Mr. Iſaac Grant

Bought of John Sims, March 12, 1778.

		s.	*a.*		
15 Yards of ſattin - -	at	9 ..	6	*per* yard	£
18 Yards of flowered ſilk	at	17 ..	4	- - -	
12 Yards of rich brocade	at	19 ..	8	- - -	
16 Yards of ſarſenet - -	at	3 ..	2	- - -	
13 Yards of Genoa velvet	at	27 ..	6	- - -	
23 Yards of luteſtring -	at	6 ..	3	- - -	

£62 .. 2.. 5

LINEN-

LINEN-DRAPER's.

Mr. Simon Surety

Bought of Joſiah Short, March 27, 1778.

			s.	*d.*		
4	Yards of cambrick -	at	12	6	*per* yard	£
12	Yards of muſlin - -	at	8	3	- - -	
15	Yards of printed linen	at	5	4	- - -	
2	Dozen of napkins - -	at	2	3	each -	
14	Ells of diaper - - -	at	1	7	*per* ell -	
35	Ells of dowlas - - -	at	1	1½	- - -	

£17 .. 4 .. 6¼

MILLENER's.

Mrs. Bright

Bought of Lucy Brown, April 5, 1778.

			l.	*s.*	*d.*		
18	Yards of fine lace -	at	–	12	3	*per* yd.	£
5	Pair of fine kid gloves	at	–	2	2	*per* pair	
12	Fans of French mounts	at	–	3	6	each -	
2	Fine laced tippets -	at	3	3	–	- -	
4	Dozen of Iriſh lamb	at	–	1	3	*per* pair	
6	Sets of knots - -	at	–	2	6	*per* ſet	

£23 .. 14 .. 4

WOOLLEN-DRAPER's.

Mr. Thomas Sage

Bought of Ellis Smith, April 7, 1778.

			l.	*s.*	*d.*		
17	Yards of fine ſerge -	at	–	3	9	*per* yd.	£
18	Yards of drugget - -	at	–	9	–	- - -	
15	Yards of ſuperfine ſcarlet	at	1	2	–	- - -	
16	Yards of black ditto -	at	–	18	–	- - -	
25	Yards of ſhalloon - -	at	–	1	9	- - -	
17	Yards of drab - - -	at	–	17	6	- - -	

£59 .. 5 .. –

LEATHER-SELLER'S

Mr. Giles Harris

Bought of Abel Smith, April 15, 1778.

			s.	d.	
27	Calf ſkins	at	3	9	*per* ſkin £
75	Sheep ſkins	at	1	7	
36	Coloured ditto	at	1	8	
15	Buck ſkins	at	11	6	
17	Ruſſia hides	at	10	7	each
120	Lamb ſkins	at	1	2½	

£38 .. 17 .. 5

GROCER'S.

Mr. Richard Groves

Bought of Francis Elliot, April 21, 1778.

			s.	d.	
25	lb. of lump ſugar	at	—	6½	*per* lb. £
2	Loaves of double refined, weight 15lb.	at	—	11½	
14	lb. of rice	at	—	3	
28	lb. of Malaga raiſins	at	—	5	
15	lb. of currants	at	—	5½	
7	lb. of black pepper	at	1	10	

£3 .. 2 .. 9½

CHEESEMONGER'S.

Mr. Charles Croſs

Bought of Samuel Grant, April 23, 1778.

			s.	d.	
8	lb. of Cambridge butter	at	—	6	*per* lb. £
17	lb. of new cheeſe	at	—	4	
½	Firkin of butter, wt. 28lb.	at	—	5½	
5	Cheſhire cheeſes, wt. 127 lb.	at	—	4	
2	Warwickſhire ditto, wt. 15 lb.	at	—	3	
12	lb. of cream cheeſe	at	—	6	

£3 .. 14 .. 7

CORN-

CORN-CHANDLER'S

Mr. Abraham Doyley

Bought of Iſaac Jones, April 29, 1778.

			s.	d.		
Tares,	19 buſhels	- at	1 ..	10 *per* buſhel	£	
Peas,	18 buſhels	- at	3 ..	9½ - - -		
Malt,	7 quarters	- at	25 ..	*per* quarter -		
Hops,	15 lb. -	- at	1 ..	5 *per* lb. - -		
Oats,	6 quarters	- at	2 ..	4 *per* buſhel -		
Beans,	12 buſhels	- at	4 ..	8 - - -		
					£23 .. 7 .. 4	

REDUCTION.

IS the bringing or reducing numbers of one denomination into other numbers of another denomination, retaining the ſame value, and is performed by multiplication and diviſion.

Firſt, All great names are brought into ſmall, by multiplying with ſo many of the leſs as make one of the greater.

Secondly, All ſmall names are brought into great, by dividing with ſo many of the leſs as make one of the greater.

A TABLE *of* ſuch COINS *as are current in* England.

	l.	*s.*	*d.*
Guinea - - -	1 ..	1 ..	—
Half ditto - -	— ..	10 ..	6
¼ ditto - - -	— ..	5 ..	3
Crown - - -	— ..	5 ..	—
Half ditto - -	— ..	2 ..	6
Shilling - - -	— ..	1 ..	—

Note, *There are ſeveral pieces which ſpeak their own value; ſuch as ſix-pence, four-pence, three-pence, two-pence, penny, half-penny, farthing.*

REDUCTION

REDUCTION *Deſcending.*

1. In £8 how many ſhillings and pence?

20

160 *ſhillings.*

12

1920 *pence.*

2. In £12 how many ſhillings pence and farthings?
Anſ. 240*s.* 2880*d.* 11520 *far.*

3. How many ſhillings, pence, and farthings, are there in £18?
Anſ. 360*s.* 4320*d.* 17280 *far.*

4. Reduce £7 and a crown into ſhillings and pence.
Facit 145*s.* 1740*d.*

5. How many farthings are there in 21 guineas?
Anſ. 21168.

6. In £17..5..3¼ how many farthings? *Anſ.* 16573.

7. In £25..14..1 how many ſhillings and pence?
Anſ. 514*s.* 6169*d.*

8. In 15 crowns how many ſhillings and ſix-pences?
Anſ. 75*s.* 150 *ſix-pences.*

9. How many crowns and ſhillings in £25?
Anſ. 100 *crowns*, 500*s.*

10. In 57 half-crowns how many pence and farthings?
Anſ. 1710*d.* 6840 *far.*

11. In 52 crowns, as many half-crowns, ſhillings, and pence, how many farthings? *Anſ.* 21424.

12. How many half-crowns, ſix-pences, and three-pences, are there in £75?
Anſ. 600 *half-crs.* 3000 *ſix-pences*, 6000 *three-pences.*

REDUCTION *Aſcending.*

13. In 1920 pence how many ſhillings and pounds?
Anſ. 160*s.* £8.

12)1920

20)1610(*ſhillings.*

8 *pounds.*

14. In

14. In 11520 farthings, how many pence, ſhillings, and pounds? *Anſ.* 2880*d.* 240*s.* £12.

15. How many pence, ſhillings, and pounds, are there in 17280 farthings? *Anſ.* 4320*d* 360*s.* £18.

16. Reduce 1740 pence into ſhillings and pounds.
Facit 145*s.* £7 .. 5.

17. How many guineas in 21168 farthings?
Anſ. 21 *guineas.*

18. In 16573 farthings, how many pounds?
Anſ. £17 .. 5 .. $3\frac{1}{4}$

19. In 6169 pence, how many ſhillings and pounds?
Anſ. 514*s.* £25 .. 14 .. 1.

20. In 900 pence, how many ſhillings and crowns?
Anſ. 75*s.* 15 *crowns.*

21. How many crowns and pounds in 500 ſhillings?
Anſ. 100 *crowns,* £25.

22. In 6840 farthings, how many pence and half-crowns? *Anſ.* 1710*d.* 57 *half-crowns.*

23. In 21424 farthings, how many crowns, half-crowns, ſhillings, and pence, and of each an equal number?
Anſ. 52.

24. How many ſix-pences, half crowns, and pounds, in 6000 three-pences?
Anſ. 3000 *ſix-pences,* 600 *half-crowns,* £75.

Aſcending and Deſcending.

25. In 1560 pence, how many crowns and ſhillings?
Anſ. 26 *crowns,* 130*s.*

6|0)156|0
26
5
130

26. Reduce 130 ſhillings into crowns and pence.
Facit 26 *crowns,* 1560*d.*

27. How many ſhillings, crowns, and pounds, in 60 guineas? *Anſ.* 1260*s.* 252 *crowns,* £63.

28. In £63, how many crowns, ſhillings, and guineas?
Anſ. 252 *crowns,* 1260*s.* 60 *gui.*

29. Reduce 76 moidores into ſhillings and pounds.
Facit 2052*s.* £102 .. 12 .. –.

30. Reduce £102 .. 12 .. – into ſhillings and moidores.
Facit 2052*s.* 76 *moidores.*

31. How many ſhillings, half crowns, and crowns, are there in £556, and of each an equal number?

Anſ 1308 *each, and* 2*s. over.*

32. In 1308 half crowns, as many crowns and ſhillings, how many pounds? *Anſ.* £555 .. 18 .. –.

33. Seven men brought £15 .. 10 .. – each into the mint, to be changed for guineas, how many muſt they have in all? *Anſ.* 103 *guineas,* 7*s. over.*

34. If 103 guineas and 7 ſhillings are to be divided amongſt 7 men, how many pounds ſterling is that to each?

Anſ. £15 .. 10 .. –.

35. A certain perſon had 25 purſes, and in each purſe 12 guineas, a crown, and a moidore, how many pounds ſterling had he in all? *Anſ.* £355.

36. A gentleman, in his will, leaves £50 to the poor, and ordered that $\frac{1}{3}$ ſhould be given to ancient men, each to have 5s. — $\frac{1}{4}$ to poor women, each to have 2s. 6d — $\frac{1}{7}$ to poor boys, each to have 1s. — $\frac{1}{8}$ to poor girls, each to have 9d. and the remainder to the perſon that diſtributed it. I demand how many of each ſort there were, and what the perſon that diſtributed the money had for his pains?

Anſ. 66 *men,* 100 *women,* 200 *boys,* 222 *girls,* £2 .. 13 .. 6 *to the perſon.*

TROY WEIGHT.

37. In 27 ounces of gold, how many grains?

Anſ. 12960.

38. In 12960 grains of gold, how many ounces?

Anſ. 27.

39. In 3 lb. 10 oz. 7 dwt. 5 gr. how many grains?

Anſ. 22253.

40. In 8 ingots of ſilver, each weighing 7 lb. 4 oz. 17 dwt. 15 gr. how many ounces, pennyweights, and grains?

Anſ. 711 *oz.* 14221 *dwt.* 34130 *gr.*

41. How many ingots of 7 lb. 4 oz. 17 dwt. 15 gr. each are there in 341304 grains? *Anſ.* 8 *ingots.*

42. Bought 7 ingots of ſilver, each containing 23 lb. 5 oz. 7 dwt. how many grains? *Anſ.* 945336.

43. A gentleman ſent a tankard to his goldſmith, that weighed 50 oz. 8 dwt. and ordered him to make it into ſpoons, each to weigh 2 oz. 16 dwt. how many had he?

Anſ. 18.

44. A gentleman delivered to a goldſmith 137 oz. 6 dwt. 9 gr. of ſilver, and ordered him to make it into tankards of 17 oz. 15 dwt. 10 gr. each, ſpoons of 21 oz. 11 dwt. 13 gr. per dozen, ſalts of 3 oz. 10 dwt. each, and forks of 21 oz. 11 dwt. 13 gr. per dozen; and, for every tankard, to have one ſalt, a dozen of ſpoons, and a dozen of forks; what is the number of each he muſt have?

Anſ. Two of each ſort, 8 oz. 9 dwt. 9 gr. over.

AVOIRDUPOISE WEIGHT.

Note, *There are ſeveral ſorts of ſilk which are weighed by a great pound of 24 oz. others by the common pound of 16 oz. therefore,*

To bring great pounds into common, multiply by 3, and divide by 2, or add one half.

To bring ſmall pounds into great, multiply by 2, and divide by 3, or ſubtract one third.

Things bought and ſold by the Tale.

Dozens.		*Paper and Parchment.*	
12 Pieces or things make	1 Doz.	24 Sheets make	1 Quire.
12 Dozen - - -	1 Groce.	20 Quire -	1 Ream.
12 Groce or 144 doz.	1 Great Groce.	2 Reams -	1 Bundle.
		1 Doz. of Par.	12 Skins.
		12 Skins - -	1 Roll.

45. In 47631 ounces, how many cwt?

Anſ. 8 cwt. 0 qr. 27 lb. 1 oz.

46 Reduce 8 cwt. 0 qr. 27 lb. 1 oz. into quarters, pounds, and ounces. *Facit* 32 *qrs.* 923 *lb.* 14769 *oz.*

47. Bought 32 bags of hops, each 2 cwt. 1 qr. 14 lb. and another of 150 lb. how many cwt. in the whole?

Anſ. 77 cwt. 1 qr. 10 lb.

48. In 34 ton, 17 cwt. 1 qr. 19 lb. how many pounds?

Anſ. 78111 lb.

49. In 350 great pounds, how many common? *Anſ. 525 lb.*

50. In 27 cwt. of raiſins, how many parcels of 18 lb. each? *Anſ. 168.*

51. In 9 cwt. 2 qrs. 14 lb. of indigo, how many pounds?

Anſ. 1078 lb.

52. In 54 great pounds, how many common pounds?
Anſ. 820 *com. lb.* 8 *oz.*

53. Bought 27 bags of hops, each 2 cwt. 1 qr. 15 lb. and 1 bag 137 lb. how many hundreds in the whole?
Anſ. 65 *cwt.* 2 *qrs.* 10 *lb.*

54. How many pounds in 27 hogſheads of tobacco, each weighing neat 8 cwt. $\frac{1}{4}$? *Anſ.* 26460.

55. In 552 common pounds of ſilk, how many great pounds? *Anſ.* 368.

56. How many parcels of ſugar of 16 lb. 2 oz. are there in 16 cwt. 1 qr. 15 lb? *Anſ.* 113 *par.* 12 *lb.* 14 *oz.*

The Allowances uſually made in this Weight are, TARE, TRETT, *and* CLOFF.

TARE is an allowance made to the buyer for the weight of the box, barrel, bag, &c. which contains the goods bought, and is either

At ſo much per box, bag, barrel, &c.

At ſo much per cent. or,

At ſo much in the groſs weight.

TRETT is an allowance of 4 lb. in every 104 lb. for waſte, duſt, &c. made by the merchant to the buyer.

CLOFF is an allowance of 2 lb. to the citizens of London, on every draught above 3 cwt. on ſome ſort of goods.

GROSS WEIGHT is the whole weight of any ſort of goods, and that which contains it.

SUTTLE is when part of the allowance is deducted from the groſs.

NEAT is the pure weight, when all allowances are deducted.

RULE 1ſt. When the tare is at ſo much per bag, barrel, &c. multiply the number of bags, barrels, &c. by the tare, and ſubtract the product from the groſs, the remainder is neat.

Note, *To reduce pounds into gallons, multiply by* 2, *divide by* 15.

57. In 7 frails of raiſin, each weighing 5 cwt. 2 qrs. 5 lb. groſs, tare at 23 lb. per frail, how much neat weight?
Anſ. 37 *cwt.* 1 *qr.* 14 *lb.*

58. In

		or thus:
23	5 .. 2 .. 5	5 .. 2 .. 5
7	7	23
4)		
28)161(5	38 .. 3 .. 7 = *gross.*	5 .. 1 .. 10
140 .. 1 .. 1	1 .. 1 .. 21 = *tare.*	7
21	27 .. 1 .. 14 *neat.*	37 .. 1 .. 14

58. In 241 barrels of figs, each 3 qrs. 19 lb. gross, tare 10 lb. *per* barrel, how many pounds neat? *Ans.* 22413.

59. What is the neat weight of 25 hogsheads of tobacco, weighing gross 163 cwt. 2 qrs. 15 lb. tare 100 lb. *per* hogshead? *Ans.* 141 *cwt.* 1 *qr.* 7 *lb.*

60. In 16 bags of pepper, each 85 lb. 4 oz. gross, tare *per* bag 3 lb. 5 oz. how many pounds neat? *Ans.* 1311.

RULE 2. When the tare is at so much in the whole gross weight, subtract the given tare from the gross, the remainder is neat.

61. What is the neat weight of 5 hogsheads of tobacco, weighing gross 75 cwt. 1 qr. 14 lb. tare in the whole 752 lb? *Ans.* 68 *cwt.* 2 *qrs.* 18 *lb.*

62. In 75 barrels of figs, each 2 qrs. 27 lb. gross, tare in the whole 597 lb. how much neat weight?

Ans. 50 *cwt.* 1 *qr.*

RULE 3. When the tare is at so much *per cent.* divide the gross weight by the aliquot parts of an cwt. which subtract from the gross, the remainder is neat.

Note. 7 lb. is $\frac{1}{16}$. 8 lb. is $\frac{1}{14}$. 14 lb. is $\frac{1}{8}$. 16 lb. is $\frac{1}{7}$.

63. What is the neat weight of 18 butts of currants, each 8 cwt. 2 qrs. 5lb. tare at 14 lb. *per cent?*

8 .. 2 .. 5
9×2=18

76 .. 3 .. 17
2

14=$\frac{1}{8}$)153 .. 3 .. 6
19 .. 0 .. 25$\frac{1}{4}$

134 .. 2 .. 8$\frac{3}{4}$

64. In 25 barrels of figs, each 2 cwt. 1 qr. groſs, tare *per cent.* 16 lb. how much neat weight?

Anſ. 48 *cwt.* 0 *qrs.* 24 *lb.*

65. What is the neat weight of 9 hogſheads of nutmegs, each weighing groſs 8 cwt. 3 qrs. 14 lb. tare 16 lb. *per cent?* *Anſ.* 68 *cwt.* 1 *qr.* 24 *lb.*

66. What is the neat weight of 12 caſks of argol, groſs 84 cwt. 2 qrs. 14 lb. tare *per cent.* 14 lb?

Anſ. 74 *cwt.* 0 *qr.* 5 *lb* $\frac{1}{4}$.

RULE 4. When trett is allowed with tare, divide the pounds ſuttle by 26, the quotient is the trett, which ſubtract from the ſuttle, the remainder is neat.

67. In one butt of currants, weighing 12 cwt. 2 qrs. 24 lb. groſs, tare 14 lb. *per cent.* trett 4 lb. *per* 104 lb. how many pounds neat?

12 .. 2 .. 24
4
50
28
14 = $\frac{1}{8}$ 1424 *groſs.*
178 *tare.*
26) 1246 *ſuttle.*
47 *trett.*
1199 *neat.*

68. In 7 cwt. 3 qrs. 27 lb. groſs, tare 36 lb. trett 4 lb. *per* 104 lb. how many lb. neat? *Anſ.* 826 *lb.*

69. In 152 cwt. 1 qr. 3 lb. groſs, tare 10 lb. *per cent.* trett 4 lb. *per* 104 lb. how much neat weight?

Anſ. 133 *cwt.* 1 *qr.* 11 *lb.*

70. In 15 cheſts of ſugar, weighing 117 cwt. 0 qr. 21 lb. groſs, tare 173 lb. trett 4 lb. *per* 104 lb. how many cwt. neat? *Anſ.* 111 *cwt.* 0 *qr.* 22 *lb.*

RULE 5. When cloff is allowed, multiply the cwt. ſuttle by 2, divide the product by 3, the quotient will be the pounds cloff, which ſubtract from the ſuttle, the remainder will be neat.

71. What

71. What is the neat weight of 3 hogſheads of tobacco, weighing 15 cwt. 3 qrs. 20 lb. groſs, tare 7 lb. *per cent.* trett 4 lb. *per* 104 lb. cloff 2 lb. for 3 cwt?

Anſ. 14 *cwt.* 1 *qr.* 3 *lb.*

$7 = \frac{1}{14}$ 15 .. 3 .. 20 *groſs.*
3 .. 27½ *tare.*

1 14 .. 3 .. 20½ *ſuttle.*
2 .. 8 *trett.*

14 .. 1 .. 12½ *ſuttle.*
9½ *cloff.*

14 .. 1 .. 3 *neat.*

72. In 7 hogſheads of tobacco, each weighing groſs 5 cwt. 2 qrs. 7 lb. tare 8 lb. *per cent.* trett 4 lb. *per* 104 lb. cloff 2 lb. *per* 3 cwt. how much neat weight?

Anſ. 34 *cwt.* 2 *qrs.* 8 *lb.*

APOTHECARIES WEIGHT.

73. 27 lb. 7 ℥. 2 ʒ. 1 ℈. 2 gr. how many grains?

Anſ. 159022.

74. How many lb. ℥. ʒ. ℈. and gr. are there in 159022 grains? *Anſ.* 27 *lb.* 7 ℥. 2 ʒ. 1 ℈. 2 *grs.*

CLOTH MEASURE.

75. In 27 yards, how many nails? *Anſ.* 432.

76. In 75 Engliſh ells, how many yards?

Anſ. 93 *yards,* 3 *qrs.*

77. In 93¾ yards, how many Engliſh ells? *Anſ.* 75.

78. In 24 pieces, each containing 32 Flemiſh ells, how many Engliſh ells? *Anſ.* 460 *ells,* 4 *qrs.*

79. In 17 pieces of cloth, each 27 Flemiſh ells, how many yards? *Anſ.* 344 *yards,* 1 *qr.*

80. Bought 27 pieces of Engliſh ſtuffs, each 27 ells, how many yards? *Anſ* 911 *yards,* 1 *qr.*

81. In 911¼ yards, how many Engliſh ells? *Anſ.* 729.

82. In 12 bales of cloth, each 25 pieces, each 15 Engliſh ells, how many yards? *Anſ.* 5625.

LONG MEASURE.

83. In 57 miles, how many furlongs and poles?
Anſ. 456 *furlongs*, 18240 *poles.*

84. In 7 miles, how many feet, inches, and barley-corns?
Anſ. 36960 *feet*, 443520 *inches*, 1330560 *barley-corns.*

85. In 18240 poles, how many furlongs and miles?
Anſ. 456 *furlongs*, 57 *miles.*

86. In 72 leagues, how many yards? *Anſ.* 380160.

87. In 380160 yards, how many miles and leagues?
Anſ. 216 *miles*, 72 *leagues.*

88. If from London to York be accounted 50 leagues, I demand how many miles, yards, feet, inches, and barley-corns? *Anſ.* 150 *miles*, 264000 *yards*, 792000 *feet*. 95[illegible]00 *inches*. 285 2000 *barley-corns.*

89. How many barley-corns will reach round the world, which is 360 degrees, each degree 69 miles and an half?
Anſ. 4755801600 *barley-corns.*

LAND MEASURE.

90. In 27 acres, how many roods and perches?
Anſ. 108 *roods*, 4320 *perches.*

91. In 4320 perches, how many acres? *Anſ.* 27.

92. A perſon having a piece of ground, containing 37 acres, 1 pole, has a mind to diſpoſe of 15 acres to A, I deſire to know how many perches he will have left?
Anſ. 3521.

93. There are 4 fields to be divided into ſhares of 75 perches each; the firſt field containing 5 acres; the ſecond, 4 acres, 2 poles; the third, 7 acres, 3 roods; and the fourth, 2 acres, 1 rood; I deſire to know how many ſhares are contained therein? *Anſ.* 40 *ſhares*, 42 *perches.*

WINE MEASURE.

94. Bought 5 tun of port wine, how many gallons and pints? *Anſ.* 1260 *gallons*, 10080 *pints.*

95. In 10080 pints, how many tuns? *Anſ.* 5.

96. In 5896 gallons of Canary, how many pipes and hogſheads, and of each a like number?
Anſ. 31 *of each*, 37 *gallons over.*

97. A

97. A gentleman ordered his butler to bottle off $\frac{2}{3}$ of a pipe of French wine into quarts, and the reſt into pints; I deſire to know how many dozen of each he had?

Anſ. 28 *dozen of each.*

ALE *and* BEER MEASURE.

98. In 46 barrels of beer, how many pints? *Anſ.* 13248.

99. In 10 barrels of ale, how many gallons and quarts?

Anſ. 320 *gals.* 1280 *qts.*

100. In 72 hogſheads of beer, how many barrels?

Anſ. 108 *barrels.*

101. In 108 barrels of beer, how many hogſheads?

Anſ. 72.

DRY MEASURE.

102. In 120 quarters of wheat, how many buſhels, pecks, gallons, and quarts?

Anſ. 960 *buſhels*, 3840 *pecks*, 7680 *gallons*, 30720 *quarts.*

103. In 30720 quarts of corn, how many quarters?

Anſ. 120.

104. In 20 chaldron of coals, how many pecks?

Anſ. 2880.

105. In 273 laſts of corn, how many pecks?

Anſ. 87360.

TIME.

106. In 72015 hours, how many weeks?

Anſ. 428 *weeks*, 4 *days*, 15 *hours.*

107. How many days is it ſince the birth of our Saviour to Chriſtmas, 1755? *Anſ.* 641013 *days*, 18 *hours.*

108. Stowe writes, London was built 1108 years before our Saviour's birth, how many hours is it ſince to Chriſtmas, 1755? *Anſ.* 25097058 *hours.*

109. From November 17, 1738, to September 12, 1739, how many days? *Anſ.* 292.

110. From July 18, 1749, to December 27, in the ſame year, how many days? *Anſ.* 162 *days.*

111. From July 18, 1723, to April 18, 1750, how many years and days? *Anſ.* 26 *years*, 9770 *days*, *reckoning* 365 *days*, 6 *hours a year.*

The SINGLE RULE *of* THREE DIRECT,

TEACHETH, by three numbers given, to find out a fourth, in ſuch proportion to the third, as the ſecond is to the firſt.

RULE. Firſt ſtate the queſtion, that is, place the numbers in ſuch order, that the firſt and third be of one kind, and the ſecond the ſame as the number required; then bring the firſt and third numbers into one name, and the ſecond into the loweſt term mentioned. Multiply the ſecond and third numbers together, and divide the product by the firſt, the quotient will be the anſwer to the queſtion in the ſame denomination you left the ſecond number in.

EXAMPLES.

1. If 1 lb. of ſugar coſt $4d\frac{1}{2}$, what coſt 54 lb.?

1 : $4\frac{1}{2}$ :: 54

4 18

18 4)972

12)243

20*s.* 3*d.*

Anſ. £1 .. – .. 3.

2. If a gallon of ale coſt 3*d.* what is that *per* barrel?
Anſ. 8*s.*

3. If a pair of ſhoes coſt 4*s.* 6*d.* what will 12 dozen come to? *Anſ.* £32 .. 8 .. –.

4. If 12 dozen pair of ſtockings coſt £32 .. 8 .. –, what is that *per* pair? *Anſ.* 4*s.* 6*d.*

5. If 1 yard of cloth coſt 15*s.* 6*d.* what will 32 yards coſt at the ſame rate? *Anſ.* £24 .. 16 .. –.

6. If 32 yards of cloth coſt £24 .. 16 .. –, what is the value of 1 yard? *Anſ.* 15*s.* 6*d.*

7. If 1 lb. of ſugar coſt 10*d.* $\frac{1}{2}$, what is the worth of 1 cwt.? *Anſ.* £4 .. 18 .. –.

8. If I gave £4 .. 18 .. –, for 1 cwt. of ſugar, at what rate did I buy it at *per* lb? *Anſ.* 10*d.* $\frac{1}{2}$.

9. If I buy 20 pieces of cloth, each 20 ells, for 12*s.* 6*d.* *per* ell, what is the value of the whole? *Anſ.* £250.

10. Bought 20 pieces of Holland, each 20 ells, for £250. what is that *per* ell? *Anſ.* 12*s.* 6*d.*

11. What

11. What will 25 cwt. 3 qrs. 14 lb. of tobacco come to, 15*d.* ½ *per* lb.? *Anſ.* £187 .. 3 .. 3.

12. I gave £187 .. 3 .. 3 for 25 cwt. 3 qrs 14 lb. of tobacco, at what rate did I buy it at *per* lb? *Anſ.* 15*d.* ½.

13. Bought 27 yds ¼ muſlin, at 6*s.* 9*d.* ½ *per* yard, what does it amount to? *Anſ.* £9 .. 5 .. −¾ 2 *rem.*

14. Bought 17 cwt. 1 qr. 14 lb. of iron, at 3*d.* ¼ *per* lb. what does it come to? *Anſ.* £26 .. 7 .. −½.

15. If coffee is ſold for 5*d* ½ *per* ounce, what muſt be given for 2 cwt.? *Anſ.* £82 .. 2 .. 8.

16. How many yards of cloth may be bought for £21 .. 11 .. 1½, when 3 yards ½ coſt £2 .. 14 .. 3.?

Anſ. 27 *yds.* 3 *qrs.* 1 *nail*, 42 *rem.*

17. If 3 lb. ½ of Cheſhire cheeſe coſt 1*s.* 1*d.* what coſt 1 cwt.? *Anſ.* £1 .. 14 .. 8.

18. If 1 cwt. of Cheſhire cheeſe coſt £1 .. 14 .. 8, what muſt I give for 3 lb. ½.? *Anſ.* 1*s.* 1*d.*

19. Bought 1 cwt. 24 lb. 8 oz. of old lead, at 9*s. per* cwt. what does it come to? *Anſ.* 10*s.* 11*d.* ½. 112 *rem.*

20. If 1 cwt. 24 lb. 8 oz. of lead be worth 10*s.* 11*d.* ½. ½½¼, what is that *per* cwt.? *Anſ.* 9*s.*

21. If a gentleman's income is £500 a year, and he ſpends 19*s.* 4*d. per* day, how much does he lay by at the year's end? *Anſ.* £147 .. 3 .. 4.

22. If I buy 14 yards of cloth for 10 guineas, how many Flemiſh ells can I buy for £283 .. 17 .. 6. at the ſame rate?

Anſ. 504 *Fl. ells*, 2 *qrs.*

23. If £283 .. 17 .. 6 will buy 504 Flemiſh ells, 2 quarters, what quantity of yards can I have for £10 .. 10 .. −?

Anſ. 14 *yds.*

24. If 504 Flemiſh ells, 2 quarters, coſt £283 .. 17 .. 6, at what rate muſt I give for 14 yards? *Anſ.* £10 .. 10 .. −.

25. Gave £1 .. 1 .. 8 for 3 lb. of coffee, what muſt be given for 29 lb. 4 oz.? *Anſ.* £10 .. 11 . 3.

26. Bought 29 lb. 4 oz. of coffee, for £10 .. 11 .. 3, what is the value of 3 lb.? *Anſ.* £1 .. 1 .. 8.

27. If 1 oz. ½ of coffee coſt 6*d.* ¼, what will 3 oz. ¼ coſt at the ſame rate? *Anſ.* 1*s.* 1*d.* ½. 1 *rem.*

28. If 1 Engliſh ell, 2 quarters, coſt 4*s.* 7*d.* what will 39 yards ½ coſt at the ſame rate? *Anſ.* £5 .. 3 .. 5¼.

29. If 1 ounce of gold is worth £5 .. 4 .. 2, what is the worth of 1 grain? *Anſ.* 2*d.* ½. 20 *rem.*

30. If

30. If 14 yards of broad cloth coſt £9 .. 12 .. –, what is the purchaſe of 75 yards? *Anſ.* £51 .. 8 .. 6¾, 6 *rem.*

31. If 27 yards of Holland coſt £ 5 .. 12 .. 6, how many ells Engliſh can I buy for £100? *Anſ.* 384.

32. If 1 cwt. coſt £12 .. 12 .. 6, what muſt I give for 14 cwt. 1 qr. 19 lb.? *Anſ.* £182 .. – .. 11½, 8 *rem.*

33. Bought 7 yards of cloth for 17*s.* 8*d.* what muſt be given for 5 pieces, each containing 27 yards ½? *Anſ.* £17 .. 7 .. –¼, 2 *rem.*

34. If 7 oz. 11 dwt. of gold be worth £35, what is the value of 14 lb. 9 oz. 12 dwt. 16 gr. at the ſame rate? *Anſ.* £823 . 9 .. 3¾, 552 *rem.*

35. A draper bought 420 yards of broad cloth, at the rate of 14*s.* 10*d.* ¾ *per* ell Engliſh, how much did he pay for the whole? *Anſ.* £250 .. 5 .. –.

36. A gentleman bought a wedge of gold, which weighed 14 lb. 3 oz. 8 dwt. for the ſum of £514 .. 4 .. –. at what rate did he pay for it *per* ounce? *Anſ.* £ 3.

37. A grocer bought 4 hogſheads of ſugar, each weighing neat 6 cwt. 2 qrs. 14 lb. which coſt him £2 .. 8 .. 6 *per* cwt. what is the value of the 4 hogſheads? *Anſ.* £64 .. 5 .. 3.

38. A draper bought 8 packs of cloth, each containing 4 parcels, each parcel 10 pieces, and each piece 26 yards, and gave after the rate of £4 .. 16 .. – for 6 yards, I deſire to know what the 8 packs ſtood him in? *Anſ.* £6656.

39. If 24 lb. of raiſins coſt 6*s.* 6*d.* what will 18 frail coſt, each weighing neat 3 qrs. 18 lb? *Anſ.* £24 .. 17 .. 3.

40. If 1 ounce of ſilver be worth 5*s.* what is the price of 14 ingots, each weighing 7lb. 5oz. 10 dwt.? *Anſ.* £313..5.

41. What is the price of a pack of wool weighing 2 cwt. 1 qr. 19 lb. at 8*s.* 6*d.* *per* ſtone? *Anſ.* £ 8 .. 4 .. 6¼, 10 *rem.*

42. Bought 59 cwt. 2 qrs. 24 lb. of tobacco, at £2 .. 17 .. 4 *per* cwt. what does it come to? *Anſ.* £171..3..7¼, 80 *rem.*

43. What is the half year's rent of 547 acres of land, at 15*s.* 6*d.* *per* acre *per annum?* *Anſ.* £211 .. 19 .. 3.

44. Bought 171 ton of lead, at £14 *per* ton; paid carriage and other incident charges, £4 .. 10 .. –, I require the value of the lead, and what it ſtands me in *per* lb.?

Anſ. £2398..10..– *value*, 1*d.* ½ 432 *rem. per* lb.

45. If a pair of ſtockings coſt 10 groats, how many dozen may I buy for £43 .. 5 .. –? *Anſ.* 21 *doz.* 7 *pair* ½.

46. Bought

46. Bought 27 dozen, 5 lb. of candles, after the rate of 17*d. per* 3 lb. what did they coſt me?

Anſ. £7 . 15 .. 4¼, 1 *rem.*

47. If an ounce of fine gold is ſold for £3 .. 10 .. –, what comes 7 ingots to, each weighing 3 lb. 7 oz. 14 dwt. 21 gr. at the ſame price? *Anſ.* £1071 .14..5¼.

48. If my horſe ſtands me in 9*d.* ½ *per* day keeping, what will be the charge of 11 horſes for the year?

Anſ. £158 .. 18 .. 6½

49. A factor bought 86 pieces of ruff, which coſt him £517 . 19 .. 4, at 4*s.* 10*d. per* yard, I demand how many yards there were, and how many ells Engliſh in a piece?

Anſ. 2143 *yards*, ¼. 14 *rem. and* 19 *ells*, 4 *quarters*, 2 *nails*, 64 *rem. in a piece.*

50. A gentleman hath an annuity of £896 .. 17 .. –, *per annum*, I deſire to know how much he may ſpend daily, that at the year's end he may lay up 200 guineas, and give to the poor quarterly 10 moidores? *Anſ.* £1 .. 14 .. 8. 44 *rem.*

The RULE *of* THREE INVERSE.

INVERSE PROPORTION is, when more requires leſs and leſs requires more. More requires leſs, is when the third term is greater than the firſt, and requires the fourth term to be leſs than the ſecond. And leſs requires more, is when the third term is leſs than the firſt, and requires the fourth term to be greater than the ſecond.

RULE. Multiply the firſt and ſecond terms together, and divide the product by the third, the quotient will bear ſuch proportion to the ſecond as the firſt does to the third.

EXAMPLES.

1. If 8 men can do a piece of work in 12 days, how many days can 16 men perform the ſame in? *Anſ.* 6 *days.*

8 : 12 : : 16 : 6

8

16)96(6 *days.*

2. If 54 men can build a houſe in 90 days, how many men can do the ſame in 50 days? *Anſ.* 97 *men*, ⅕.

3. If

3. If, when a peck of wheat is ſold for 2*s.* the penny loaf weighs 8 oz. how much will it weigh when the peck is worth but 1*s.* 6*d.*? *Anſ.* 10 *z.* 10 *dr.* $\frac{2}{3}$

4. How many pieces of money of 20*s.* value are equal to 240 pieces of 12*s.* each? *Anſ.* 144.

5. How many yards of three quarters wide are equal in meaſure to 30 yards of 5 quarters wide? *Anſ.* 50.

6. If I lend my friend £200 for 12 months, how long ought he to lend me £150 to requite my kindneſs?

Anſ. 16 *months.*

7. If for 24*s.* I have 1200 lb. carried 36 miles, how many pounds can I have carried 24 miles for the ſame money? *Anſ.* 1800 *lb.*

8. If 100 workmen finiſh a piece of work in 12 days, how many are ſufficient to finiſh it in 3 days? *Anſ.* 400.

9. An army beſieging a town, in which were 1000 ſoldiers, with proviſions for 3 months, how many ſoldiers departed, when the proviſions laſted them 6 months?

Anſ. 500.

10. If £20 worth of wine is ſufficient to ſerve an ordinary of 100 men, when the tun is ſold for £30, how many will £20 worth ſuffice, when the tun is ſold but for £24?

Anſ. 125 *men.*

11. A courier makes a journey in 24 days, when the day is but 12 hours long; how many days will he be going the ſame journey, when the days are 16 hours long?

Anſ. 18 *days.*

12. How much pluſh is ſufficient for a cloak, which has in it 4 yards of 7 quarters wide of ſtuff for the lining, the pluſh being but 3 quarters wide? *Anſ.* 9 *yards* $\frac{1}{3}$.

13. If 14 pioniers make a trench in 18 days, how many days will 34 take to do the ſame?

Anſ. 7 *days*, 4 *hours*, 56 *minutes*, 16 *rem.*

14. Borrowed of my friend £64 for 8 months, and he hath occaſion another time to borrow of me for 12 months, how much muſt I lend him to requite his former kindneſs to me? *Anſ.* £42..13..4.

15. A regiment of ſoldiers, conſiſting of 1000 men, are to have new coats, each coat to contain 2 yards $\frac{1}{2}$ of cloth, 5 quarters wide, and to be lined with ſhalloon of 3 quarters wide, I demand how many yards of ſhalloon will line them?

Anſ. 4166 *yards*, 2 *quarters*, 2 *nails*, 2 *rem.*

The DOUBLE RULE *of* THREE,

IS ſo called, becauſe it is compoſed of 5 numbers given to find a ſixth, which, if the proportion is direct, muſt bear ſuch proportion to the 4th and 5th, as the third bears to the 1ſt and 2d. But if in verſe, the 6th number muſt bear ſuch proportion to the 4th and 5th, as the firſt bears to the 2d and 3d. The three firſt terms are a ſuppoſition; the two laſt, a demand.

RULE 1. Let the principal cauſe of loſs or gain, intereſt or decreaſe, action or paſſion, be put in the firſt place.

2. Let that which betokeneth time, diſtance of place, and the like, be in the ſecond place, and the remaining one in the third.

3. Place the other two terms under their like, in the ſuppoſition.

4. If the blank falls under the third term, multiply the firſt and ſecond terms for a diviſor, and the other three for a dividend. But,

5. If the blank falls under the firſt or ſecond term, multiply the third and fourth terms for a diviſor, and the other three for the dividend, and the quotient will be the anſwer.

PROOF. By two ſingle rules of three.

EXAMPLES.

1. If 14 horſes eat 56 buſhels of oats in 16 days, how many buſhels will be ſufficient for 20 horſes 24 days?

By two ſingle rules,

	hor.	*bu.*	*hor.*	*bu.*
1. *As*	14	: 56	: : 20	: 80
	days.	*bu.*	*days*	*bu.*
2. *As*	16	: 80	: : 24	: 120

or in one ſtating.

hor.	*days.*	*bu.*
14	: 16	: 56
20	: 24	: —

Worked thus

$$\frac{56 \times 20 \times 24}{14 \times 16} = 120$$

2. If 8 men in 14 days can mow 112 acres of graſs, how many men muſt there be to mow 2000 acres in 10 days?

	acres.	*days.*	*acres.*	*days.*
1. *As*	112	: 14	: : 2000	: 250
	days.	*men.*	*days.*	*men.*
2. *As*	250	: 8	: : 10	: 200

men.	*days.*	*acres.*
8	: 14	: 112
—	: 10	: 2000

$$\frac{8 \times 14 \times 2000}{112 \times 10} = 200$$

3. If

3. If £100, in 12 months, gain £6 intereſt, how much will £79 gain in 9 months? *Anſ.* £3..7..6.

4. If a carrier receives £2..2..– for the carriage of 3 cwt. 150 miles, how much ought he to receive for the carriage of 7 cwt. 3 qrs. 14 lb. for 50 miles? *Anſ.* £1..16..9.

5. If a regiment of ſoldiers, conſiſting of 136 men, conſume 351 quarters of wheat in 108 days, how many quarters of wheat will 11232 ſoldiers conſume in 56 days? *Anſ.* 15031.

6. If 40 acres of graſs be mowed by 8 men in 7 days, how many acres can be mowed by 24 men in 28 days? *Anſ.* 480.

7. If 40*s.* will pay 8 men for 5 days work, how much will pay 32 men for 24 days work? *Anſ.* £38..8..–.

8. If £100, in 12 months, gain £6 intereſt, what principal will gain £3 .. 7 .. 6 in 9 months? *Anſ.* £75.

9. If a regiment, conſiſting of 939 ſoldiers, conſume 351 quarters of wheat in 168 days, how many ſoldiers will conſume 1404 quarters in 56 days? *Anſ.* 11268.

10. In a family conſiſting of 7 perſons, there are drank out 2 kilderkins of beer in 12 days, how many kilderkins will there be drank out by another family of 14 perſons in 8 days? *Anſ.* 2 *kil.* 12 *gals.*

11. If the carriage of 60 cwt. 20 miles, coſt £14 .. 10 ..–, what weight can I have carried 30 miles, for £5 .. 8 .. 9, at the ſame rate of carriage? *Anſ.* 15 *cwt.*

12. If 2 horſes eat 8 buſhels of oats in 16 days, how many horſes will eat up 3000 quarters in 24 days? *Anſ.* 4000.

13. If £100, in 12 months, gain £7 intereſt, what is the intereſt of £571 for 6 years? *Anſ.* £239..16..4$\frac{3}{4}$.

14. If I pay 10*s.* for the carriage of 2 ton, 6 miles, what muſt I pay for the carriage of 12 tons 17 cwt. 17 miles? *Anſ.* £9..2..–$\frac{1}{2}$.

PRACTICE,

IS ſo called, from the general uſe thereof by all perſons concerned in trade and buſineſs.

All queſtions in this rule are performed by taking aliquot or even parts, by which means many tedious reductions are avoided; the table of which is as follows:

Of a Pound.	*Of a Shilling.*	*Of a Ton.*	*Of an Hundred.*
s. d.	*d.*	*cwt.*	*qrs. lb.*
10 .. – is - $\frac{1}{2}$	6 - is - - $\frac{1}{2}$	10 - is - - $\frac{1}{2}$	2 or 56 - is $\frac{1}{2}$
6 .. 8 - - $\frac{1}{3}$	4 - - - - $\frac{1}{3}$	5 - - - - $\frac{1}{4}$	1 or 28 - - $\frac{1}{4}$
5 .. – - - $\frac{1}{4}$	3 - - - - $\frac{1}{4}$	4 - - - - $\frac{1}{5}$	14 - - $\frac{1}{8}$
4 .. – - - $\frac{1}{5}$	2 - - - - $\frac{1}{6}$	2 $\frac{1}{2}$ - - - $\frac{1}{8}$	*Of a Quarter.*
3 .. 4 - - $\frac{1}{6}$	1 $\frac{1}{2}$ - - - $\frac{1}{8}$	2 - - - - $\frac{1}{10}$	14 - - - - $\frac{1}{2}$
2 .. 6 - - $\frac{1}{8}$	1 - - - - $\frac{1}{12}$		7 - - - - $\frac{1}{4}$
2 .. – - - $\frac{1}{10}$			4 - - - - $\frac{1}{7}$
1 .. 8 - - $\frac{1}{12}$			3 - - - - $\frac{1}{8}$

RULE 1. When the price is less than a penny divide by the aliquot parts that are in a penny; then by 12 and 20, it will be the answer.

$\frac{1}{4}$ is $\frac{1}{4}$ 5704 *lb.* at $\frac{1}{4}$	7695 at $\frac{1}{2}$	6547 at $\frac{3}{4}$
12)1426	*Facit* £16..–..7$\frac{1}{2}$	*Facit* £20..9..2$\frac{1}{4}$
2|0) 11|8..10	5740 at $\frac{1}{2}$	4573 at $\frac{3}{4}$
£5..18..10	*Facit* £11..19..2	*Facit* £14..5..9$\frac{3}{4}$

RULE 2. When the price is less than a shilling, take the aliquot part or parts that are in a shilling, add them together, and divide by 20, as before.

1 is $\frac{1}{12}$ 7547 at 1*d.*	6254 at 1*d.*$\frac{3}{4}$	7062 at 3*d.*$\frac{1}{4}$
2|0)62|8..11	*Facit* £45..12..–$\frac{1}{2}$	*Facit* £95..12..7$\frac{1}{2}$
£31..8..11	2351 at 2*d.*	2147 at 3*d.*$\frac{1}{2}$
1 is $\frac{1}{12}$ 3751 at 1*d.*$\frac{1}{4}$	*Facit* £19..11..10	*Facit* £31..6..2$\frac{1}{2}$
$\frac{1}{4}$ is $\frac{1}{4}$) 312..7	7210 at 2*d.*$\frac{1}{4}$	7000 at 3*d.*$\frac{3}{4}$
78..1$\frac{3}{4}$	*Facit* £67..11..10$\frac{1}{2}$	*Facit* £109..7..6
2|0)39|0..8$\frac{3}{4}$	2710 at 2*d.*$\frac{1}{2}$	3257 at 4*d.*
19..10..8$\frac{3}{4}$	*Facit* £28..4..7	*Facit* £54..5..8
54325 at 1*d.*$\frac{1}{2}$	3250 at 2*d.*$\frac{3}{4}$	2056 at 4*d.*$\frac{1}{4}$
Facit £339..10..7$\frac{1}{2}$	*Facit* £37..4..9$\frac{1}{2}$	*Facit* £36..8..2
	2715 at 3*d.*	3752 at 4*d.*$\frac{1}{2}$
	Facit £33..18..9	*Facit* £70..7..–

2107 at 4*d*.¼ *Facit* £41..14..–¼	3254 at 7*d*.¼ *Facit* £98..5..11½	2150 at 9*d*.¾ *Facit* £87..6..10½
3210 at 5*d*. *Facit* £66..17..6	2701 at 7*d*.½ *Facit* £84..8..1½	6325 at 10*d*. *Facit* £263..10..10
2715 at 5*d*.¼ *Facit* £59..7..9¾	3714 at 7*d*.¾ *Facit* £119..18..7½	5724 at 10*d*.¼ *Facit* £244..9..3
3120 at 5*d*.½ *Facit* £71..10..–	2710 at 8*d*. *Facit* £90..6..8	6327 at 10*d*.¼ *Facit* £270..4..3¾
7521 at 5*d*.¾ *Facit* £180..3..9¼	3514 at 8*d*.¼ *Facit* £120..16..10½	3254 at 10*d*.½ *Facit* £142..7..3
3271 at 6*d*. *Facit* £81..15..6	2759 at 8*d*.½ *Facit* £97..14..3½	7291 at 10*d*.¾ *Facit* £326..11..6¼
7914 at 6*d*.¼ *Facit* £206..1..10½	9872 at 8*d*.¾ *Facit* £359..18..4	3256 at 11*d*. *Facit* £149..4..8
3250 at 6*d*.½ *Facit* £88..–..5	5272 at 9*d*. *Facit* £197..14..–	7254 at 11*d*.¼ *Facit* £340..–..7½
2708 at 6*d*.¾ *Facit* £76..3..3	6325 at 9*d*.¼ *Facit* £243..15..6¼	3754 at 11*d*.½ *Facit* £179..17..7
3271 at 7*d*. *Facit* £95..8..1	7924 at 9*d*.½ *Facit* £313..13..2	7972 at 11¾ *Facit* £390..5..11

RULE 3. When the price is more than one ſhilling, and leſs than two, take the part or parts, with ſo much of the given price as is more than a ſhilling, which add to the given quantity, and divide by 20, it will give the anſwer.

¼ ⅕ 2106 at 12*d*.¼ 43..10½ 2|0)214|9..10½ 107..9..10½	½ ¼ 3715 at 12*d*.½ 154..9½ 2|0)386|9..9½ 193..9..9½	2712 at 12*d*.¾ *Facit* £144..1..6 2107 at 1*s*. 1*d*. *Facit* £114..2..7

3215 at 1*s.* 1*d.*¼ *Facit* £177..9..10¾	3725 at 1*s.* 5*d.* *Facit* £263..17..1	1004 at 1*s.* 8*d.*¾ *Facit* £86..16..1
2790 at 1*s.* 1*d.*½ *Facit* £156..18..9	7250 at 1*s.* 5*d.*¼ *Facit* £521..1..10½	2104 at 1*s.* 9*d.* *Facit* £184..2..–
7904 at 1*s.* 1*d.*¾ *Facit* £452..16..8	2597 at 1*s.* 5*d.*½ *Facit* £189..7..3½	2571 at 1*s.* 9*d.*¼ *Facit* £227..12..9¾
3750 at 1*s.* 2*d.* *Facit* £218..15..–	7210 at 1*s.* 5*d.*¾ *Facit* £533..4..9½	2104 at 1*s.* 9*d.*½ *Facit* £188..9..8
3291 at 1*s.* 2*d.*¼ *Facit* £195..8..–¾	7524 at 1*s.* 6*d.* *Facit* £564..6..–	7506 at 1*s.* 9*d.*¾ *Facit* £680..4..7½
9254 at 1*s.* 2*d.*½ *Facit* £559..1..11	7103 at 1*s.* 6*d.*¼ *Facit* £540..2..5¾	1071 at 1*s.* 10*d.* *Facit* £98..3..6
7250 at 1*s.* 2*d.*¾ *Facit* £445..11..5½	3254 at 1*s.* 6*d.*½ *Facit* £250..16..7	5200 at 1*s.* 10*d.*¼ *Facit* £482..1..8
7591 at 1*s.* 3*d.* *Facit* £474..8..9	7925 at 1*s.* 6*d.*¾ *Facit* £619..2..9¼	2117 at 1*s.* 10*d.*½ *Facit* £198..9..4½
6325 at 1*s.* 3*d.*¼ *Facit* £401..18..–¼	9271 at 1*s.* 7*d.* *Facit* £733..19..1	1007 at 1*s.* 10*d.*¾ *Facit* £95..9..1¼
5271 at 1*s.* 3*d.*½ *Facit* £340..8..4½	7210 at 1*s.* 7*d.*¼ *Facit* £578..6..–½	5000 at 1*s.* 11*d.* *Facit* £479..3..4
3254 at 1*s.* 3*d.*¾ *Facit* £213.10.10½	2310 at 1*s.* 7*d.*½ *Facit* £187..13..9	2105 at 1*s.* 11*d.*¼ *Facit* £203..18..5¼
2915 at 1*s.* 4*d.* *Facit* £194.6..8	2504 at 1*s.* 7*d.*¾ *Facit* £206..1..2	1006 at 1*s.* 11*d.*½ *Facit* £98..10..1
3270 at 1*s.* 4*d.*¼ *Facit* £221..8..1½	7152 at 1*s.* 8*d.* *Facit* £596..–..–	2705 at 1*s.* 11*d.*¾ *Facit* £267..13..7¼
7059 at 1*s.* 4*d.*½ *Facit* £485..6..1½	2905 at 1*s.* 8*d.*¼ *Facit* £245..2..2¼	5000 at 1*s.* 11*d.*½ *Facit* £489..11..8
2750 at 1*s.* 4*d.*¾ *Facit* £191..18..6½	7104 at 1*s.* 8*d.*½ *Facit* £606..16..–	4000 at 1*s.* 11*d.*¾ *Facit* £395..16..8

RULE 4. When the price consists of any even number of shillings under 20, multiply the given quantity by half the price, doubling the first figure of the product for shillings, and the rest of the product will be pounds.

2750 at 2*s*. *Facit* £275 .. – .. –	2102 at 10*s*. *Facit* £1051 .. – .. –	1075 at 16*s*. *Facit* £860 .. – .. –
3254 at 4*s*. *Facit* £650 .. 16 .. –	2101 at 12*s*. *Facit* £1260 .. 12 .. –	1621 at 18*s*. *Facit* £1458 .. 18 .. –
2710 at 6*s*. *Facit* £813 .. – .. –	5271 at 14*s*. *Facit* £3689 .. 14 .. –	Note, *When the price is* 10*s*. *take half of the quantity, and if any remains, it is* 10*s*.
1572 at 8*s*. *Facit* £628 .. 16 .. –	3123 at 16*s*. *Facit* £2498 .. 8 .. –	

RULE 5. When the price consists of odd shillings, multiply the given quantity by the price, and divide by 20, the product will be the answer.

2703 at 1*s*. *Facit* £135 .. 3 .. –	2715 at 7*s*. *Facit* £950 .. 5 .. –	2150 at 15*s*. *Facit* £1612 .. 10 .. –
3270 at 3*s*. 3 2|0)981|0 £490 .. 10 .. –	3214 at 9*s*. *Facit* £1446 .. 6 .. –	3142 at 17*s*. *Facit* £2670 .. 14 .. –
	2710 at 11*s*. *Facit* £1490 .. 10 .. –	2150 at 19*s*. *Facit* £2042 .. 10 .. –
3271 at 5*s*. *Facit* £817 .. 15 .. –	3179 at 13*s*. *Facit* £2066 .. 7 .. –	7157 at 19*s*. *Facit* £6799 .. 3 .. –
	Note, *When the price is* 5*s*. *divide the quantity by* 4, *and if any remains it is* 5*s*.	

RULE 6. When the price is shillings and pence, and they the aliquot part of a pound, divide by the aliquot part, and it will give the answer at once; but if they are not an aliquot part, then multiply the quantity by the shillings, and take parts for the rest, add them together, and divide by 20.

s.	*d.*		
6	8	$\frac{1}{3}$	2710 at 6*s.* 8*d.*
			£903 .. 6 .. 8
			3150 at 3*s.* 4*d.*
			Facit £525 .. — .. —
			2715 at 2*s.* 6*d.*
			Facit £339 .. 7 .. 6
			7150 at 1*s.* 8*d.*
			Facit £595 .. 16 .. 8
			3215 at 1*s.* 4*d.*
			Facit £214 .. 6 .. 8
			7211 at 1*s.* 3*d.*
			Facit £450 .. 13 .. 9
d.			
2		$\frac{1}{6}$	2710 at 3*s.* 2*d.*
			3
			8130
			451 .. 8
		2|0	858|1 .. 8
			£429 .. 1 .. 8
			7514 at 4*s.* 7*d.*
			Facit £1721 .. 19 .. 2
			2517 at 5*s.* 3*d.*
			Facit £660 .. 14 .. 3
			2547 at 7*s.* 3*d.* $\frac{1}{2}$
			Facit £928 .. 11 .. 10 $\frac{1}{2}$
			3271 at 5*s.* 9*d.* $\frac{1}{4}$
			Facit £943 .. 16 .. 4 $\frac{3}{4}$
			2103 at 15*s.* 4*d.* $\frac{1}{2}$
			Facit £1616 .. 13 .. 7 $\frac{1}{2}$
			7152 at 17*s.* 6*d* $\frac{3}{4}$
			Facit £6280 .. 7 .. —
			2510 at 14*s.* 7*d.* $\frac{1}{4}$
			Facit £1832 .. 16 .. 5 $\frac{1}{2}$
			3715 at 9*s.* 4*d.* $\frac{1}{2}$
			Facit £1741 .. 8 .. 1 $\frac{1}{2}$
			2572 at 13*s.* 7*d.* $\frac{1}{2}$
			Facit £1752 .. 3 .. 6
			7251 at 14*s.* 8*d.* $\frac{1}{4}$
			Facit £5324 .. 19 .. — $\frac{1}{4}$
			3210 at 15*s.* 7*d.* $\frac{3}{4}$
			Facit £2511 .. 3 .. 1 $\frac{1}{2}$
			2710 at 19*s.* 2*d* $\frac{1}{2}$
			Facit £2602 .. 14 .. 7

RULE 7. 1*ſt*. When the price is pounds and ſhillings, multiply the quantity by the pounds, and proceed with the ſhillings, if they are even, as in the 4th rule; if odd, take the aliquot parts, add them together, the ſum will be the anſwer.

2*dly*, When pounds ſhillings and pence, and the ſhillings and pence the aliquot part of a pound, multiply the quantity by the pounds, and take parts for the reſt.

3*dly*, When the price is pounds, ſhillings, pence and farthings, and the ſhillings and pence not the aliquot parts

of a pound, reduce the pounds and shillings into shillings, multiply the quantity by the shillings, take parts for the rest, add them together, and divide by 20.

Note, *When the given quantity is no more than three figures, proceed as in* Compound Multiplication.

4	$\frac{1}{5}$	7215 at £7..4..– 7
		50505 1443
		51948£.
s. d.		
2..6	$\frac{1}{8}$	2104 at £5..3..– 5
		10520 263
6	$\frac{1}{5}$	52..12
		10835..12
		2107 at £2..8..– *Facit* £5056..16..–
		2156 at £5..6..– *Facit* £37926.16.–
6	$\frac{1}{2}$	2710 at £2..3..7$\frac{1}{2}$ 43
$1\frac{1}{2}$	$\frac{1}{4}$	116530 1355 338..9
	2|0	11822|3..9
		£5911..3..9
		3215 at £1..17..– *Facit* £5947..15..–

2107 at £1..13..– *Facit* £3476..11..–	
3215 at £4..6..8 *Facit* £13931.13.4	
2154 at £7..1..3 *Facit* £15212.12.6	
2701 at £2..3..4 *Facit* £5852..3..4	
2715at£1..17..2$\frac{1}{2}$ *Facit* £5051..–..7$\frac{1}{2}$	
2157at£3..15..2$\frac{1}{4}$ *Facit* £8108.19 5$\frac{1}{4}$	
3210at£1..18..6$\frac{3}{4}$ *Facit* £6189..5..7$\frac{1}{2}$	
2157 at£2..7..4$\frac{1}{2}$ *Facit* £5109.7.10$\frac{1}{2}$	
142 at£1..15..2$\frac{3}{4}$ *Facit* £250..2..6$\frac{1}{2}$	
95 at £15..14..7$\frac{1}{4}$ *Facit* £1494..7..4$\frac{3}{4}$	
37 at£1..19..5$\frac{3}{4}$ *Facit* £73..–..8$\frac{1}{4}$	
2175 at£2..15..4$\frac{1}{2}$ *Facit* £6022..–..7$\frac{1}{2}$	
2150 at£17..16.1$\frac{1}{2}$ *Facit* £38283..8..9	

RULE 8. When the price and quantity given are of ſeveral denominations, multiply the price by the integers, and take part with the parts of the integers for the reſt.

At £3..17..6 per cwt. what is the value of 25 cwt. 2 qrs. 14 lb. of tobacco?

qrs.			
2	½	£3 .. 17 .. 6	5×5=25
		5	
		19 .. 7 .. 6	
		5	
		96 .. 17 .. 6	
lb.		1 .. 18 .. 9	
14	¼	9 .. 8¼	
		99 .. 5 .. 11¼	

2. At £1..4..9 per cwt. what comes 17 cwt. 1 qr. 17 lb. of cheeſe to? *Anſ.* £21 .. 10 .. 8

3. Sold 85 cwt. 1 qr. 10 lb. of cheeſe, at £1..7..8 per cwt. what does it come to? *Anſ.* £118..1..–½

4. Hops at £4..5..8 per cwt. what muſt be given for 72 cwt. 1 qr. 18 lb. *Anſ.* £310..3..2

5. At £1..1..4 per cwt. what is the value of 27 cwt. 2 qrs. 15 lb. of Malaga raiſins? *Anſ.* £29..9..6¼

6. Bought 78 cwt. 3 qrs. 12 lb. of currants, at £2..17..9 per cwt. what did I give for the whole? *Anſ.* £227..14..–

7. Sold 56 cwt. 1 qr. 17 lb. of ſugar, at £2..15..9 the cwt. what does it come to? *Anſ.* £157..4..4½

8. Tobacco at £3..17..10 the cwt. what is the worth of 97 cwt. 15 lb.? *Anſ.* £378..–..3

9. At £4..14..6 the cwt. what is the value of 37 cwt. 2 qrs. 13 lb. of double refined ſugar? *Anſ.* 177..14..8½

10. Bought ſugar at £3..14..6 the cwt. what did I give for 15 cwt. 1 qr. 10 lb.? *Anſ.* £57..2..9

11. At £4..15..4 the cwt. the value of 172 cwt. 3 qrs. 12 lb. of tobacco is required? *Anſ.* £823..19..–¼

12. Soap at £3..11..6 the cwt. what is the value of 53 cwt. 17 lb.? *Anſ.* £190..–..4

INTEREST.

INTEREST.

INTEREST is either SIMPLE or COMPOUND.

SIMPLE INTEREST

IS the PROFIT allowed in lending or forbearance of any ſum of money, for a determined ſpace of time.

The PRINCIPAL, is the money lent, for which Intereſt is to be received.

The RATE PER CENT, is a certain ſum agreed on between the borrower and the Lender, to be paid for every £100. for the uſe of the Principal 12 months.

The AMOUNT is the Principal and Intereſt added together.

INTEREST is alſo applied to Commiſſion, Brokage, Purchaſing of Stocks, and Inſurance.

To find the Intereſt of any Sum of Money for a Year.

RULE. Multiply the Principal by the Rate per Cent: that product, divided by 100, will give the intereſt required.

For ſeveral Years.

Multiply the Intereſt of one year by the number of years given in the queſtion, and the product will be the anſwer.

EXAMPLES.

1. What is the intereſt of £375 for a year, at 5 *per cent. per annum?*

5
375
18|75
20
15|00

Anſ. £18 .. 15 .. —.

2. What is the intereſt of £268 for one year, at 4 *per cent. per annum?* *Anſ.* 10 .. 14 .. $4\frac{3}{4}$.

3. What is the intereſt of £945 .. 10 .. —. for a year, at 4 *per cent. per annum?* *Anſ.* £37 .. 16 .. $4\frac{3}{4}$.

4. What is the intereſt of £547 .. 15 .. —. at 5 *per cent. per annum*, for 3 years? *Anſ.* £82 .. 3 .. 3.

5. What

5. What is the intereſt of £254 .. 17 .. 6 for 5 years, at 4 *per cent. per annum?* *Anſ.* £50 .. 19 .. $5\frac{3}{4}$

6. What is the intereſt of £556 .. 13 .. 4 at 5 *per cent. per annum*, for 5 years? *Anſ.* £139 .. 3 .. 4

COMMISSION

Is an allowance from merchants to their factors or correſpondents, in the buying or ſelling of goods, and is generally at a certain Rate per Cent. according to the cuſtom of the country where the factor reſides.

RULE. Multiply the Principal by the Rate per Cent. as before; and for $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$, take the part or parts from the Principal, which added to the Product, and divided by 100, will give the Anſwer.

7. What is the commiſſion of £287 .. 10 .. –, at $3\frac{1}{2}$ *per cent?*

$\frac{1}{4}$, $\frac{1}{2}$, 287..10

3

862..10 = 3

143..15 = $\frac{1}{2}$

10106..5 = $3\frac{1}{2}$

20

1|25

12

3|00

Anſ. 10 .. 1 .. 3.

8. What muſt I allow my correſpondent for diſburſing on my account £529 .18..5, at $2\frac{1}{4}$ *per cent?*

Anſ. £11..18..$5\frac{1}{2}$

9. My correſpondent writes me word, that he has bought goods to the amount of £754..16..–, on my account, what does his commiſſion come to at $2\frac{1}{4}$ *per cent?*

Anſ. £18..17..$4\frac{3}{4}$

19. If I allow my factor $3\frac{3}{4}$ *per cent.* for commiſſion, what may he demand, on the laying out £876..5..10?

Anſ. £32..17..$2\frac{1}{2}$

PURCHASING *of* STOCKS.

RULE. Multiply the ſum to be purchaſed by the exceſs, above 100; divide that product by 100, the produce of which, added to the given ſum, is the purchaſe required.

If

If under Par (that is under £100) multiply by the Rate per Cent. that product, divided by 100, gives the purchaſe thereof.

11. What is the purchaſe of £575..10..– Bank Stock, at 131¼ *per cent.* ?

6×5+1=31

575..10
6
3453
5
17265..—..–=30
½ ½ 575..10..–= 1
¼ ¼ 287..15..–= ½
143..17..6= ¼
182|72.. 2..6=31¼
20
14|42
12
5|10
575..10..–
182..14..5
£758.. 4..5 *Anſwer.*

12. What is the purchaſe of £254..17..– Bank Annuities, at 97¼ *per cent* ?

12×8+1=97

254..17
12
3058.. 4
8
24465..12..–=96
¼ ¼ 254..17..–= 1
63..14..3= ¼
247|84..3..–=97¼
20
16|83
12
9|99
4
3|96
£247..16..9¾ *Anſwer.*

13. At 110¼ *per cent.* what is the purchaſe of £2054..16..– South-ſea Stock? *Anſ.* £2265..8..4

14. At 104⅜ *per cent.* South-ſea Annuities, what is the purchaſe of £1797..14..–? *Anſ.* £1876..6..11¼

15. What is the purchaſe of £2750..17..– South-ſea Old Annuities, at 102⅛ *per cent.* ? *Anſ.* £2823..1..2¼

16. At 96¼ *per cent.* what is the purchaſe of £577..19..– Bank Annuities? *Anſ.* £559..3..3¾

17. At 124⅝ *per cent.* what is the purchaſe of £758..17..10 India Stock? *Anſ.* £945..15..4½

BROKAGE.

BROKAGE

Is an allowance to brokers, for helping merchants or factors to perſons to buy or ſell them goods.

RULE. Divide the ſum given by 100, and take parts from the quotient with the Rate per Cent.

18. If I employ a broker to ſell goods for me, to the value of £2575..17..6, what is the brokage, at 4*s. per cent.*?

25|75 .. 17 .. 6
20

15|17
12

2|10

4*s.* $\frac{1}{5}$ 25 .. 15 .. 2

Anſwer. 5 .. 3 .. $-\frac{1}{4}$

19. What is the brokage of £796..14..7, at 6*s. per cent.*?
Anſ. £2 .. 7 .. $9\frac{1}{2}$

20. When a broker ſells goods to the amount of £7105..5..10, what may he demand for brokage, if he is allowed 5*s.* 6*d. per cent.*? *Anſ.* £19 .. 10 .. $9\frac{1}{4}$

21. If a broker is employed to buy a quantity of goods, to the value of £975..6..4, what is the brokage, at 6*s.* 6*d. per cent.*? *Anſ.* £3 .. 3 .. $4\frac{1}{2}$

When the time is $\frac{1}{4}$, $\frac{1}{2}$, *or* $\frac{3}{4}$ *of a year, beſides a number of years given.*

RULE. Take parts of the intereſt for one year, which add to the intereſt of the ſeveral years given, and it will give the anſwer.

22. What is the intereſt of £554..10..– for 3 months, at 4 *per cent. per annum*?

554..10
4

22|18..–
20

3|60
12

m. 7|20
3 $\frac{1}{4}$ 22 .. 3 .. 7

Anſ. 5 .. 10 .. $10\frac{3}{4}$

23. What is the intereſt of £336..15..6 for 2 years $\frac{3}{4}$, at 5 *per cent. per annum*?

336..15..6
5

1683..17..6
20

16|77
12

9|30
4

1|20

$\frac{1}{2}$ $\frac{1}{4}$
$\frac{1}{4}$ $\frac{1}{4}$

16..16..$9\frac{3}{4}$
2

33..13..$6\frac{1}{2}$
8.. 8..$4\frac{3}{4}$
4.. 4..$2\frac{1}{4}$

Anſ. 46.. 6..$1\frac{1}{4}$

24. What is the intereſt of £325..7..6, at 6 *per cent. per annum*, for 3 years and a half? *Anſ.* £68..6..6¼

25. What is the intereſt of £547..2..4, for 5 years and a half, at 4 *per cent. per annum?* *Anſ.* £120..7..3½

26. What is the intereſt of £257..5..1, at 4 *per cent.* for a year and three quarters? *Anſ.* £18..–..1½

27. What is the intereſt of £479..5..–, for 5 years 1 quarter, at 5 *per cent. per annum?* *Anſ.* £125..16..–¾

When the Rate per Cent. is ¼, ½, or ¾ *more than the pounds given in the rate*, proceed as in Commiſſion, and it will give the anſwer for 1 year; and for ſeveral, proceed as in the laſt rule.

28. What is the intereſt of £175..17..–, for 2 years and 3 quarters, at 4½ *per cent. per annum?*

½ ½ 175..17
4
703.. 8..–
87..18..6
7|91.. 6..6
20
18|26
12
3|18

½ ½ 7..18..3
2
15..16..6
¼ ½ 3..19..1½
1..19..6¾
£21..15..2¼ *Anſ.*

29. What is the intereſt of £397..9..5, for 2 years and 1 quarter, at 3½ *per cent. per annum?* *Anſ.* 31..6..–

30. What is the intereſt of £576..2..7, for 7 years and 1 quarter, at 4½ *per cent. per annum?* *Anſ.* £187..19..1½

31. What is the intereſt of £279..13..8, at 5¼ *per cent. per annum*, for 3 years and a half? *Anſ.* £51..7..10

When the intereſt is required for any number of weeks.

RULE. As 52 weeks are to the intereſt of the given ſum for a year: ſo are the weeks given, to the intereſt required.

32. What is the intereſt of £379 .. 13 .. 2 for 4 weeks, at 4 *per cent. per annum?*

w.	£.	*s.*	*d.*	*w.*
As 52 :	15	3	$8\frac{1}{2}$	: : 4 :

20
303
12
36+4
4
14578
4
4)
52)58312(1121
52
12)280$\frac{1}{4}$
63
52
2|0)2|3..4$\frac{1}{4}$
111 1..3..4$\frac{1}{4}$
104
72
52
20

379 .. 13 .. 2
4
15|18 .. 12 .. 8
20
3|72
12
8|72
4
2|88

Or thus: multiply by the number of weeks, and divide the product by 4 *and* 13, *being* 4 × 13 = 52 13)15 .. 3 .. $8\frac{1}{2}$

1 .. 3 .. $4\frac{1}{4}$

N. B. *As it is* 4 *weeks, I don't multiply, but only divide by* 13.

33. What is the intereſt of £259 .. 13 .. 5 for 20 weeks, at 5 *per cent. per annum?* *Anſ.* £4 .. 19 .. $10\frac{1}{4}$.

34. What is the amount of £375 .. 6 .. 1 for 12 weeks, at $4\frac{1}{2}$ *per cent. per annum?* *Anſ.* £379 .. 4 .. $0\frac{1}{4}$.

35. What is the amount of £256 .. 5 .. 3 for 25 weeks, at $2\frac{3}{4}$ *per cent. per annum?* *Anſ.* £259 .. 13 .. –.

When the intereſt is for any number of days.

RULE. Multiply the pence of the principal by the days and rate *per cent.* for a dividend, cut off two figures on the right-hand, and divide by 365, the quotient will be the anſwer in pence. Or,

As 365 days, are to the intereſt of the given ſum for a year: ſo are the days given, to the intereſt required.

36. What is the intereſt of £240 for 120 days, at 4 *per cent. per annum?*

240
240
57600
120
6912000
4
12)
365)276480|00(757
2555
2098
1825
2730
2555
175
4
)700(1
365
335

Or thus.

240 As 365 : 9..12::120
4 20
960 192
20 120
12|00 365)23040(6|3
2190
1140
1095
45
12
)540(1
365
175
4
)700(1
365
335

2|0)6|3..1
3..3..1¼.

37. What is the intereſt of £397 .. 5 .. 4 for 3 years and 75 days, at 5 *per cent. per annum?* *Anſ.* £63 .. 13 .. 5.

38. At £5 ½ *per cent. per annum*, what is the intereſt of £985 .. 2 .. 7 for 5 years, 127 days? *Anſ.* £289 .. 15 .. 3.

39. What is the intereſt of £2726 .. 1 .. 4 at 4½ *per cent. per annum*, for 3 years, 154 days? *Anſ.* £419 .. 15 .. 6½

When the amount, time, and rate per cent. *are given to find the principal.*

RULE. As the amount of £100 at the rate and time given: is to £100 : : ſo is the amount given : to the principal required.

40. What

40. What principal being put to intereſt will amount to £402..10..– in 5 years, at 3 *per cent. per annum?*

3×5+100=£115 : 100 : : 402..10
20 20
2300 8050
100

23|00)8050|00(£350 *Anſ.*

41. What principal being put to intereſt for 9 years will amount to £734..8..–, at 4 *per cent. per annum?* *Anſ.* £540.

42. What principal being put to intereſt for 7 years, at 5 *per cent. per annum*, will amount to £334..16..–? *Anſ.* £248.

When the principal, rate per cent. *and amount are given, to find the time.*

RULE. As the intereſt of the principal for 1 year: is to 1 year : : ſo is the whole intereſt to the time required.

43. In what time will £350 amount to £402..10..–. at 3 *per cent. per annum?*

350 As 10..10 : 1 : : 52..10 : 5
3 20 20
10|50 210 21|0)105|0(5 *Anſ.* 402 .. 10
20 105 350 .. —
10|00 ... 52 .. 10

44. In what time will £540 amount to £734..8..–, at 4 *per cent. per annum?* *Anſ.* 9 *years.*

45. In what time will £248 amount to £334..16..–, at 5 *per cent. per annum?* *Anſ.* 7 *years.*

When the principal, amount, and time are given, to find the rate per cent.

RULE. As the principal : is to the intereſt for the whole time : : ſo is £100 : to the intereſt for the ſame time. Divide that intereſt by the time, and the quotient will be the rate *per cent.*

46. At what rate *per cent.* will £350 amount to £402 .. 10 .. – in 5 years time?

350 | 52 .. 10 .. –

As 350 : 52 .. 10 : : 100 : £15.

20

1050
100

35|0)10500|0(300s.=£15÷5=3 *per cent.*

47. At what rate *per cent.* will £248 amount to £334..16..– in 7 years time? *Anſ.* 5 *per cent.*

48. At what rate *per cent.* will £540 amount to £734..8..– in 9 years time? *Anſ.* 4 *per cent.*

Compound INTEREST

Is that which ariſes both from the principal and intereſt; that is, when the intereſt on money becomes due, and not paid, the ſame intereſt is allowed on that intereſt unpaid, as was on the principal before.

RULE 1. Find the firſt year's intereſt, which add to the principal; then find the intereſt of that ſum, which add as before, and ſo on for a number of years.

2. Subtract the given ſum from the laſt amount, and it will give the Compound Intereſt required.

EXAMPLES.

1. What is the compound intereſt of £500 forborne 3 years, at 5 *per cent. per annum?*

500 | 500 | 525
25 | 20..5

25|00 | 525 *1ſt year.* | 551..5 *2d year.*
5 | 5

26|25 | 27|56..5
20 | 20

5|00 | 11|25
12

3|00

551..5
27..11..3

578..16..3 *3d year.*
500 *prin. ſub.*

78..16..3=*intereſt.*
for 3 years.

2. What is the amount of £400 forborne $3\frac{1}{2}$ years, at 6 *per cent. per annum*, compound intereſt? *Anſ.* £490..13..11$\frac{1}{4}$

3. What

3. What will £650 amount to in 5 years, at 5 *per cent. per annum*, compound intereſt? *Anſ.* £829..11..7½.

4. What is the amount of £550..10..–, for 3 years and 6 months, at 6 *per cent. per annum*, compound intereſt; *Anſ.* £675..6..5.

5. What is the compound intereſt of £764 for 4 years and 9 months, at 6 *per cent. per annum*? *Anſ.* £243..18..8½

6. What is the compound intereſt of £57..10..6 for 5 years, 7 months, and 15 days, at 5 *per cent. per annum*? *Anſ.* £18..3..8¼.

7. What is the compound intereſt of £259..10..– for 3 years, 9 months, and 10 days, at 4½ *per cent. per annum*? *Anſ.* 46..19..10¼.

REBATE *or* DISCOUNT

IS the abating ſo much money on a debt, to be received before it is due, as that money, if put to intereſt, would gain in the ſame time, and at the ſame rate. As £100 preſent money would diſcharge a debt of £105 to be paid a year to come, rebate being made at 5 *per cent.*

RULE. As £100 with the intereſt for the time given is to that intereſt : : ſo is the ſum given : to the rebate required.

Subtract the rebate from the given ſum, and the remainder will be the preſent worth.

EXAMPLES.

1. What is the diſcount and preſent worth of £487..12 for 6 months, at 6 *per cent. per annum*?

6 *m* ½ 6 — 3 — 100 — 103

As 103 : 3 : : 487..12

20 — 2060

20 — 9752 — 3

£. s.

206|0)2925|6(14..4 *rebate.*

206

865

824

416 = 4*s.*

487..12 — 14.. 4 — *Anſ.* 473..8..– *preſent worth*

2. What is the preſent payment of £357..10..–, which was agreed to be paid 9 months hence, at 5 *per cent. per annum?* *Anſ.* £344..11..7.

3. What is the diſcount of £275..10..– for 7 months, at 5 *per cent per annum?* *Anſ.* £7..16..1¾.

4. Bought goods to the value of £109..10..–, to be paid at 9 months, what preſent money will diſcharge the ſame, if I am allowed 6 *per cent. per annum* diſcount?

Anſ. 104..15..8½.

5. What is the preſent worth of £527..9..1, payable 7 months hence, at 4¼ *per cent?* *Anſ.* 514..13..10¾.

6. What is the diſcount of £85..10..– due September the 8th, this being July the 4th, rebate at 5 *per cent. per annum?* *Anſ.* 15*s*..3*d*.½.

7. Sold goods for £875..5..6, to be paid 5 months hence, what is the preſent worth at 4½ *per cent.?*

Anſ. £859..3..4.

8. What is the preſent worth of £500, payable in 10 months, at 5 *per cent. per annum?* *Anſ.* 480.

9. How much ready money can I receive for a note of £75 due 15 months hence, at 5 *per cent.?*

Anſ. £70. 11..9¼.

10. What will be the preſent worth of £150 payable at 3 four months; *i. e.* one third at 4 months, one third at 8 months, and one third at 12 months, at 5 *per cent.* diſcount? *Anſ.* £145..3..9¼.

11. Sold goods to the value of £575..10..–, to be paid at two 3 months, what muſt be diſcounted for preſent payment, at 5 *per cent.?* *Anſ.* £10..11..4¾

12. What is the preſent worth of £500 at 4 *per cent.* £100 being to be paid down, and the reſt at two 6 months?

Anſ. £488..7..9.

EQUATION *of* PAYMENTS

IS when ſeveral ſums are due at different times to find a mean time for paying the whole debt: to do which, this is the common

RULE. Multiply each term by its time, and divide the ſum of the products by the whole debt, the quotient is accounted the mean time.

EXAMPEES.

EXAMPLES.

1. A owes B £200, whereof £40 is to be paid at 3 months, £60 at 5 months, and £100 at 10 months; at what time may the whole debt be paid together, without prejudice to either?

£.		m.		
40	×	3	=	120
60	×	5	=	300
100	×	10	=	1000
				2|00)14|20

7 *months*, $\frac{7}{10}$.

2. B owes C £800, whereof £200 is to be paid at 3 months, £100 at 4 months, £300 at 5 months, and £200 at 6 months; but they agreeing to make but one payment of the whole, I demand what that time must be?

Anſ. 4 *months*, 18 *days*.

3. I bought of K a quantity of goods to the value of £360, which was to have been paid as follows: £120 at 2 months, £200 at 4 months, and the reſt at 5 months; but we afterwards agreed to have it paid at one mean time; that time is demanded? *Anſ.* 3 *months*, 13 *days*.

4. A merchant bought goods to the value of £500, to pay £10 at the end of 4 months, £150 at the end of 6 months, and £250 at the end of 12 months; but afterwards they agreed to diſcharge the debt at one payment; at what time was this payment made? *Anſ.* 8 *months*, 12 *days*.

5. H is indebted to L a certain ſum, which is to be paid at 6 different payments, that is, $\frac{1}{4}$ at 2 months, $\frac{1}{3}$ at 3 months, $\frac{1}{8}$ at 4 months, $\frac{1}{4}$ at 5 months, $\frac{1}{6}$ at 6 months, and the reſt at 7 months; but they agree that the whole ſhall be paid at one equated time, what is that time?

Anſ. 4 *months, one quarter.*

6. A is indebted to B £120, whereof $\frac{1}{2}$ is to be paid at 3 months, $\frac{1}{4}$ at 6 months, and the reſt at 9 months, what is the equated time of the whole payments?

Anſ. 5 *months*, 7 *days*.

BARTER

BARTER

IS the exchanging one commodity for another; and informs the traders so to proportion their goods, that neither may sustain loss.

RULE. 1*st*, Find the value of that commodity whose quantity is given; then find what quantity of the other, at the rate proposed, you may have for the same money.

2*dly*, When one has goods at a certain price, *ready money*, but in Bartering advances it to something more, find what the other ought to rate his goods at, in proportion to that advance, and then proceed as before.

EXAMPLES.

1. What quantity of chocolate, at 4*s*. per lb. must be delivered in barter for 2 cwt. of tea, at 9*s*. per lb.?

```
   2 cwt.
  112
  ----
  224
    9
  ----
4)2016 the value of the tea.
  ----
  504 lb. of chocolate.
```

2. A and B barter; A hath 20 cwt. of prunes, at 4*d*. per lb. ready money, but in barter will have 5*d*. per lb. and B hath hops worth 32*s*. per cwt. ready money; what ought B to rate his hops at in barter, and what quantity must be given for the 20 cwt. of prunes?

```
        112     As 4 : 5 : : 32 :
         20                  5
  s.   ----                ----
 40    2240              4)160
 12       5                ----
 ---------- cwt. qr. lb.  40 S.
48|0)1120|0(23..1..9 16/48 Ans.
       96
      ----
       160
       144
      ----
        16=1qr.9lb.16/48.
```

3. How

3. How much tea, at 9*s.* per lb. can I have in barter for 4 cwt. 2 qrs. of chocolate, at 4*s.* per lb.? *Anſ.* 2 *cwt.*

4. Two merchants barter; A hath 20 cwt. of cheeſe, at 21*s.* 6*d.* per cwt. B hath eight pieces of Iriſh cloth, at £3..14..– per piece; I deſire to know who muſt receive the difference, and how much?

Anſ. B muſt receive of A £8..2..–.

5. A and B barter; A hath $3\frac{1}{2}$ lb. of pepper, at 13*d.*$\frac{1}{2}$ per lb. B hath ginger, at 15*d.*$\frac{1}{4}$ per lb. how much ginger muſt he deliver in barter for the pepper? *Anſ.* 3*lb.* 1*oz.* $\frac{35}{61}$.

6. How many dozen of candles, at 5*s.* 2*d.* per dozen, muſt be delivered in barter for 3 cwt. 2 qrs. 16 lb. of tallow, at 37*s.* 4*d.* per cwt.? *Anſ.* 26*doz.* 3*lb.*

7. A hath 608 yards of cloth, worth 14*s.* per yard, for which B giveth him £125 .. 12 .. – in ready money, and 85 cwt. 2 qrs. 24 lb. of bees wax. The queſtion is, what did B reckon his bees-wax at per cwt.? *Anſ.* £3..10..–

8. A and B barter; A hath 320 dozen of candles, at 5*s.* 6*d.* per dozen, for which B giveth him £30 in money, and the reſt in cotton, at 8*d.* per lb. I deſire to know how much cotton B gave A, beſides the money?

Anſ. [illegible] *cwt.* 1 *qr.* £15

9. If B hath cotton, at 1*s.* 2*d.* per lb. how much muſt he give A for 114 lb. of tobacco, at 6*d.* per lb?

Anſ. 48*lb.* $\frac{12}{14}$.

10. C hath nutmegs worth 7*s.* 6*d.* per lb. ready money, but in barter will have 8*s.* per lb. and D hath leaf tobacco worth 9*d.* per lb. ready money, how much muſt D rate his tobacco at per lb. that his profit may be equivalent with C's? *Anſ.* 9d.$\frac{1}{2}$ $\frac{36}{90}$.

PROFIT *and* LOSS

IS a rule that diſcovers what is got or loſt in the buying or ſelling of goods; and inſtructs us to riſe or fall the price, ſo as to gain or loſe ſo much *per cent.* or otherwiſe.

The queſtions in this rule are performed by the Rule of Three.

EXAMPLES.

EXAMPLES.

1. If a yard of cloth is bought for 11.. and sold for 12*s.* 6*d.* what is the gain *per cent.*?

As 11 : 1..6 : : 100

	12	20
	18	2000
12..6		18
11..–		11)36000
1..6		12)3272
		2|0)27|2..8

Ans. 13..12..8 $\frac{8}{11}$

2. If 60 ells of holland cost £18, what must 1 ell be sold for to gain 8 *per cent.*?

As 100 : 18 : : 108

108	
1|00)19|44	12×5=60
20	12)19..8..9½
8|80	5)1..12..4¾
12	6..5¼
9|60	
4	
2|40	

Ans. 6*s.* 5*d.* ¾

3. If 1 lb. of tobacco cost 16*d.* and is sold for 20*d.* what is the gain *per cent.*? *Ans.* £25.

4. If a parcel of cloth be sold for £560, and at £12 *per cent.* gain, what was the prime cost? *Ans.* £500.

5. If a yard of cloth is bought for 13*s.* 4*d.* and sold again for 16*s.* what is the gain *per cent.*? *Ans.* 20.

6. If 112. of iron cost 27*s.* 6*d.* what must 1 cwt. be sold for, to gain 15 *per cent.*? *Ans.* £1..11..7½.

7. If 375 yards of broad cloth be sold for £490, and 20 *per cent.* profit, what did it cost *per* yard? *Ans.* £1..1..9¼.

8. Sold 1 cwt. of hops for £6..15..–, at the rate of 25 *per cent.* profit, what would have been the gain *per cent.* if I had sold them for £8. *per* cwt.? *Ans.* £48..2..11½.

9. If 90 ells of cambric cost £60, how must I sell it *per* yard to gain £18 *per cent.*? *Ans.* 12*s.* 7*d.*

10. A plumber sold 10 fother of lead for £204..15..–, (the fother being 19 cwt.½) and gained after the rate of £12..10..– *per cent.* what did it cost him *per* cwt.?

Ans. 18*s.* 8*d.*

11. Bought 436 yards of cloth, at the rate of 8*s.* 6*d.* *per* yard, and sold it for 10*s.* 4*d.* *per* yard, what was the gain of the whole? *Ans.* £39..19..4.

12. Paid £69 for one ton of steel, which is retailed at 6*d.* *per* lb. what is the profit or loss by the sale of 14 tons?

Ans. £182 *loss.*

13. Bought 124 yards of linen for £32, how ſhould the ſame be retailed *per* yard to gain £15 *per cent?*

Anſ. 5*s.* 11*d.* $\frac{28}{124}$.

14. Bought 249 yards of cloth, at 3*s.* 4*d.* *per* yard, retailed the ſame at 4*s.* 2*d.* *per* yard, what is the profit in the whole, and how much *per cent.?*

Anſ. £10..7..6 *profit, and* £25 *per cent.*

FELLOWSHIP

IS when two or more join their ſtocks and trade together, ſo to determine each perſon's particular ſhare of the gain or loſs, in proportion to his principal in the joint ſtock.

By this rule a bankrupt's eſtate may be divided amongſt his creditors; as alſo legacies may be adjuſted when there is a deficiency of aſſets or effects.

FELLOWSHIP *is either with or without* TIME.

FELLOWSHIP *without* TIME.

RULE. As the whole ſtock : is to the whole gain or loſs : : ſo is each man's ſhare in ſtock : to his ſhare of the gain or loſs.

PROOF. Add all the ſhares together, and the ſum will be equal to the given gain or loſs;—but the ſureſt way is, as the whole gain or loſs : is to the whole ſtock : : ſo is each man's ſhare of the gain or loſs : to his ſhare in ſtock.

EXAMPLES.

1. Two merchants trade together; A put into ſtock £20, and B £40, they gained £50, what is each perſon's ſhare thereof?

20+40=60

As 60 : 50 : : 20 — 20 — 6|0)100|0 — £16..13..4

As 60 : 50 : : 40 — 40 — 6|0)200 0 — £33..6..8

33.. 6 .8 B's *ſhare.*
16..13..4 A's.
50

2. Three

2. Three merchants trade together, A, B, and C; A put in £20, B £30, and C £40, they gained £180, what is each man's part of the gain? *Ans.* A £40, B £60, C £80.

3. A, B, and C enter into partnership; A puts in £364, B £482, and C £500, and they gained £867, what is each man's share in proportion to his stock?

Ans. A £234..9. $3\frac{1}{4}$—*rem.* 70. B £310..9..5—*rem.* 248.
C £322..1..$3\frac{1}{2}$—*rem.* 1028.

4. Four merchants, B, C, D, and E, made a stock; B put in £227, C £349, D £115, and E £459, in trading they gained £428, I demand each merchant's share of the gain?

Ans. B £8[illegible]..9..$8\frac{3}{4}$—[illegible]0. C £1[illegible]..9$\frac{1}{4}$—170.
D £4[illegible]..16..[illegible]—[illegible]. E £1[illegible]..6$\frac{1}{2}$—[illegible]0.

5. Three persons, D, E, and F, join in company; D's stock was £750, E's £460, and F's 500, and at the end of 12 months they gained £684, what is each man's particular share of the gain? *Ans.* D £300, E £184, and F £200.

6. A merchant is indebted to B £275 .. 14 .. –, to C £304..7..–, to D £152, and to E £104..6..–, but upon his decease, his estate is found to be worth but £675..15, how must it be divided among his creditors?

Ans. B's £222..15..2—6584. C's £245..18..$1\frac{1}{2}$—15750.
D's £122..16..$2\frac{3}{4}$—12227, *and* E's £84..5..5—15620.

7. Four persons trading together in a joint stock, of which A has $\frac{1}{3}$, B $\frac{1}{4}$, C $\frac{1}{5}$, and D $\frac{1}{6}$, and at the end of 6 months they gain £100, what is each man's share of the said gain? *Ans.* A £35 .. 1 .. 9—48. B £26 .. 6 .. $3\frac{3}{4}$—36.
C £21..1..–$\frac{1}{2}$—120 *and* D £17..10..$10\frac{1}{2}$—24.

8. Two persons purchased an estate of £1700 *per annum* freehold for £27200, when money was at 6 *per cent.* interest, and 4*s.* per pound land-tax, whereof D paid £15000, and E the rest; sometime after the interest of money falling to 5 *per cent.* and 2*s.* per pound land-tax, they sell the said estate for 24 years purchase; I desire to know each person's share? *Ans.* D £22500; E £18300.

9. D, E and F, join stocks in trade; the amount of their stocks is £647, and are in proportion as 4, 6 and 8 are to one another, and the amount of this gain is equal to D's stock; what is each man's stock and gain?

D's *stock*,	£143..15..$6\frac{1}{2}$ $\frac{2}{3}$	*gain*,	£31 .19..–	184036.
E's - -	215..13..4		47..18..6	414080.
F's - -	287..11..$1\frac{1}{4}$ $\frac{1}{3}$		63..18..–	506098.

10. D, E, and F, join ſtocks in trade; the amount of their ſtocks was £100, D's gain £3, E's £5, and F's £8; what was each man's ſtock?

Anſ. D's *ſtock* £18..15..–. E's £31..5..–. *and* F's £50.

FELLOWSHIP *with* TIME.

RULE. As the ſum of the products of each man's money and time: is to the whole gain or loſs :: ſo is each man's product : to his ſhare of the gain or loſs.

PROOF. As in Fellowſhip without Time.

EXAMPLES.

2. D and E enter into partnerſhip; D puts in £40 for three months, and E £75 for four months, and they gained £70. What is each man's ſhare of the gain?

Anſ. D £20, E £50.

40×3=120 As 420 : 70 :: 120 As 420 : 70 :: 300
75×4=300 120 300
420 42|0)840|0 42|0)2100|0
20 50

2. Three merchants join in company, D puts in ſtock £195..14..– for 3 months, E £169..18..3 for 5 months, and F £59..14..10 for 11 months, they gained £364..18..–. What is each man's part of the gain?

Anſ. D's £102..6..4—5008. E's £148..1..1½—482802. *and* F's £114..10..6¼—14707.

3. Three merchants join in company for 18 months, D put in £500, and at 5 months end took out £200; at 10 months end put in £300, and at the end of 14 months takes out £130. E puts in £400, and at the end of 3 months £270 more; at 9 months he takes out £140, but puts in £100 at the end of 12 months, and withdraws £99 at the end of 15 months. F puts in £900, and at 6 months took out £200; at the end of 11 months put in £500, but takes out that and £100 more at the end of 13 months. They gained £200. I deſire to know each man's ſhare of the gain? *Anſ.* D £50..7..6—21720. E £62..12..5¼—29859. *and* F £87..–..¼—14167.

4. D, E, and F, hold a piece of ground in common, for which they are to pay £36..10..6; D puts in 23 oxen 27 days; E 21 oxen 35 days; and F 16 oxen 23 days. What is each man to pay of the said rent?

Ans. D £13..[illegible] E £15..8..[illegible] *and* F £[illegible]1136.

7. 16. 10.

ALLIGATION.

ALLIGATION *is either* MEDIAL *or* ALTERNATE.

ALLIGATION MEDIAL

IS when the price and quantities of several simples are given to be mixed, to find the mean price of that mixture.

RULE. As the whole composition : is to its total value : : so is any part of the composition : to its mean price.

PROOF. Find the value of the whole mixture at the mean rate, and if it agrees with the total value of the several quantities at their respective prices, the work is right.

EXAMPLES.

1. A farmer mixed 20 bushels of wheat, at 5*s.* per bushel, and 36 bushels of rye, at 3*s.* per bushel, with 40 bushels of barley, at 2*s.* per bushel. I desire to know the worth of a bushel of this mixture?

20	×	5	=	100
36	×	3	=	108
40	×	2	=	80
96				288

As 96 : 288 : : 1 : 3

Ans. 3.

2. A vintner mingles 15 gallons of Canary, at 8*s.* per gallon, with 20 gallons, at 7*s.* 4*d.* per gallon, 10 gallons of Sherry, at 6*s* 8*d.* per gallon, and 24 gallons of White Wine, at 4*s.* per gallon. What is the worth of a gallon of this mixture? *Ans.* 6*s.* 2*d.* $\frac{1}{2}\frac{46}{69}$.

3 A grocer mingled 4 cwt. of sugar, at 56*s.* per cwt. 7 cwt. at 43*s.* per cwt. and 5 cwt. at 37*s.* per cwt. I demand the price of 2 cwt. of this mixture? *Ans.* £4. 8..9.

4. A maltster

4. A maltſter mingles 30 quarters of brown malt at 28*s.* per quarter, with 46 quarters of pale, at 30*s.* per quarter, and 24 quarters of high-dried ditto, at 25*s.* per quarter. What is the value of 8 buſhels of this mixture?

Anſ. £1..8..2$\frac{1}{4}\frac{6}{10}$.

5. If I mix 27 buſhels of wheat, at 5*s.* 6*d.* the buſhel, with the ſame quantity of rye, at 4*s.* per buſhel, and 14 buſhels of barley, at 2*s.* 8*d.* per buſhel. What is the worth of a buſhel of this mixture? *Anſ.* 4*s.* 3*d.* $\frac{3}{4}\frac{28}{68}$.

6. A grocer mingled 3 cwt. of ſugar, at 56*s.* per cwt. 6 cwt. at £1..17..4 per cwt. and 3 cwt. at £3..14..8 per cwt. What is 1 cwt. of this mixture worth?

Anſ. £2..11..4.

7. A mealman has flour of ſeveral ſorts, and would mix 3 buſhels at 3*s.* 5*d.* per buſhel, 4 buſhels at 5*s.* 6*d.* per buſhel, and 5 buſhels at 4*s.* 8*d.* per buſhel. What is the worth of a buſhel of this mixture? *Anſ.* 4*s.* 7*d.* $\frac{1}{2}\frac{4}{12}$.

8. A vintner mixes 20 gallons of Port, at 5*s.* 4*d.* per gallon, with 12 gallons of White Wine, at 5*s.* per gallon, 30 gallons of Liſbon, at 6*s.* per gallon, and 20 gallons of Mountain, at 4*s.* 6*d.* per gallon. What is a gallon of this mixture worth? *Anſ.* 5*s.* 3*d* $\frac{3}{4}\frac{50}{82}$.

9. A farmer mingled 20 buſhels of wheat, at 5*s.* per buſhel, and 36 buſhels of rye, at 3*s.* per buſhel, with 40 buſhels of barley, at 2*s.* per buſhel. I deſire to know the worth of a buſhel of this mixture? *Anſ.* 3*s.*

10. A perſon mixing a quantity of oats, at 2*s.* 6*d.* per buſhel, with the like quantity of beans, at 4*s.* 6*d.* per buſhel, would be glad to know the price of one buſhel of that mixture? *Anſ.* 3*s.* 6*d.*

11. A refiner having 12lb. of ſilver bullion, of 6 oz. fine, would melt it with 8 lb. of 7 oz. fine, and 10 lb. of 8 oz. fine, required the fineneſs of 1 lb. of that mixture?

Anſ. 6 *oz.* 18 *dwt.* 16 *gr.*

12. If with 40 buſhels of corn, at 4*s.* per buſhel, there are mixed 10 buſhels at 6*s.* per buſhel, 30 buſhels at 5*s.* per buſhel, and 20 buſhels at 3*s.* per buſhel. What will 10 buſhels of that mixture be worth? *Anſ.* £2..3..–.

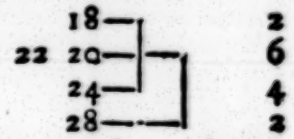
13. A tobacconiſt would mix 50 lb. of tobacco, at 11*d.* per lb. with 30 lb. at 14*d.* per lb. 25 lb. at 22*d.* per lb. and 37 lb. at 2*s.* per lb. What will 1 lb. of this mixture be worth? *Anſ.* 16*d.* $\frac{3}{4}\frac{11}{12}\frac{1}{2}$.

ALLIGATION ALTERNATE

Is when the prices of ſeveral things are given, to find ſuch quantities of them to make a mixture, that may bear a price propounded.

In ordering the rates and given price, obſerve,

1. Place them one under the other and the propounded price or mean rate on the left hand of them thus



2. Link the ſeveral rates together by 2 and 2, always obſerving to join a greater and a leſs than the mean.

3. Againſt each extreme place the difference of the mean and its yoke-fellow.

When the prices of the ſeveral ſimples and the mean rate are given without any quantity, to find how much of each ſimple is required to compoſe the mixture.

RULE. Take the difference between each price and the mean rate, and ſet them alternately, they will be the anſwer required.

PROOF. By Alligation Medial.

EXAMPLES.

1. A vintner would mix four ſorts of wines together, of 18*d.* 20*d.* 24*d.* and 28*d.* per quart. What quantity of each muſt he take to ſell the mixture at 22*d.* per quart.

Anſwer.		*Proof.*
18	2 of 18*d.* =	36*d.*
20	6 of 20*d.* =	120
22		
24	4 of 24*d.* =	96
28	2 of 28*d.* =	56
14		)308
		22*d.*

Or Thus

18	6 of 18*d.* =	108*d.*
20	2 of 20*d.* =	40
22		
24	2 of 24*d.* =	48
28	4 of 28*d.* =	112
14		)308
		22*d.*

Note. *Queſtions in this rule admit of a great variety of* anſwers, *according to the manner of linking them.*

2. A grocer would mix ſugar, at 4*d.* 6*d.* and 10*d.* per lb. ſo as to ſell the compound for 8*d.* per lb. What quantity of each muſt he take? *Anſ.* 2*lb.* *at* 4*d.* 2*lb.* *at* 6*d.* *and* 6*lb.* *at* 10*d.*

3. I deſire

3. I desire to know how much tea, at 16*s.* 14*s.* 9*s.* and 8*s.* per lb. will compose a mixture worth 10*s.* per lb.?

Ans. 1 *lb. at* 16*s.* 2 *lb. at* 14*s.* 6 *lb. at* 9*s. and* 4 *lb. at* 8*s.*

4. A farmer would mix as much barley at 3*s.* 6*d.* per bushel, rye at 4*s.* per bushel, and oats at 2*s.* per bushel, as to make a mixture worth 2*s.* 6*d.* per bushel. How much is that of each sort? *Ans.* 6 *of barley,* 6 *of rye, and* 30 *of oats.*

5. A grocer would mix Raisins of the Sun at 7*d. per* lb. with Malaga's at 6*d.* and Smyrna's at 4*d. per* lb. I desire to know what quantity of each sort he must take to sell them at 5*d.* per lb.? *Ans.* 1 *lb. of Raisins of the Sun,* 1 *lb. of Malaga's, and* 3 *lb. Smyrna's.*

6. A tobacconist would mix tobacco of 2*s.* 1*s.* 6*d.* and 1*s.* 3*d.* per lb. so as the compound may bear a price of 1*s.* 8*d.* per lb. What quantity of each sort must he take?

Ans. 7 *lb. at* 2*s.* 4 *lb. at* 1*s.* 6*d. and* 4 *lb. at* 1*s.* 3*d.*

ALTERATION PARTIAL

IS when the prices of all the simples, the quantity of but one of them, and the mean rate, are given to find the several quantities of the rest in proportion to that given.

RULE. Take the difference between each price, and the mean rate, as before. Then,

As the difference of that simple, whose quantity is given : is to the rest of the differences severally : : so is the quantity given : to the several quantities required.

EXAMPLES.

1. A tobacconist being determined to mix 20 lb. of tobacco, at 15*d.* per lb. with others at 16*d.* per lb. 18*d.* per lb. and 22*d.* per lb. How many pounds of each sort must he take to make one pound of that mixture worth 17*d.*?

		Answer.	*Proof.*	
15 —	5	20 lb. at 15*d.* = 300*d.*		As 5 : 1 : : 20 : 4
16 —	1	4 lb. at 16*d.* = 64*d.*		As 5 : 1 : : 20 : 4
18 —	1	4 lb. at 18*d.* = 72*d.*		As 5 : 2 : : 20 : 8
22 —	2	8 lb. at 22*d.* = 176*d.*		
Ans.	36 lb.		612*d.* : : 1 lb. : 17*d.*	

2. A farmer would mix 20 buſhels of wheat, at 60*d.* the buſhel, with rye at 36*d.* barley at 24*d.* and oats at 18*d.* per buſhel. How much muſt he take of each ſort, to make the compoſition worth 32*d.* per buſhel?

Anſ. 20 *buſhels of wheat*, 35 *buſhels of rye*, 70 *buſhels of barley, and* 10 *buſhels of oats.*

3. A perſon is deſirous of mixing wheat at 4*s.* per buſhel, rye at 3*s.* per buſhel, and barley at 2*s.* per buſhel, with 12 buſhels of oats, at 18*d.* per buſhel. I would be glad to know how many buſhels of each ſort he muſt take, to make the compoſition worth 3*s.* 6*d.* per buſhel?

Anſ. 96 *buſhels of wheat*, 12 *buſhels of rye*, 12 *of barley, and* 12 *of oats.*

4. A diſtiller would mix 40 gallons of French brandy, at 12*s.* per gallon, with Engliſh at 7*s.* and ſpirits at 4*s.* per gallon. What quantity of each ſort muſt he take, to afford it for 8*s.* per gallon?

Anſ. 40 *gallons French*, 32 *Engliſh, and* 32 *ſpirits.*

5. A grocer would mix teas of 12*s.* 10*s.* and 6*s.* with 20 lb. at 4*s.* per lb. How much of each ſort muſt he take, to make the compoſition worth 8*s.* per lb.?

Anſ. 20 *lb. at* 4*s.* 10 *lb. at* 6*s.* 10 *lb. at* 10*s. and* 20 *lb. at* 12*s.*

6. A wine merchant is deſirous of mixing 18 gallons of Canary, at 6*s.* 9*d.* per gallon, with Malaga, at 7*s.* 6*d.* per gallon; Sherry, at 5*s.* per gallon; and White Wine, at 4*s.* 3*d.* per gallon. How much of each ſort muſt he take, that the mixture may be ſold for 6*s.* the gallon?

Anſ. 18 *gallons of Canary*, 31 ½ *of Malaga*, 13 ½ *of Sherry, and* 27 *of White Wine.*

ALTERATION TOTAL

Is when the price of each ſimple, the quantity to be compounded, and the mean rate, are given to find how much of each ſort will make that quantity.

RULE. Take the difference between each price, and the mean rate, as before; then,

As the ſum of the difference : is to each particular difference : : ſo is the quantity given : to the quantity required.

EXAMPLES.

EXAMPLES.

1. A grocer has four ſorts of ſugar, *viz.* 12*d.* 10*d.* 6*d.* and 4*d.* per lb. and would make a compoſition of 144 lb. worth 8*d.* per lb. I deſire to know what quantity of each he muſt take?

		Anſwer.		*Proof.*	
12	4	48 at	12*d.*	576	As 12 : 4 : : 144 : 48
8 10	2	24 at	10*d.*	240	As 12 : 2 : : 144 : 24
6	2	24 at	6*d.*	144	
4	4	48 at	4*d.*	192	
12	144			)1152(8*d.*	

2. A druggiſt having four ſorts of tea, of 5*s.* 6*s.* 8*s.* and 9*s.* per lb. would have a compoſition of 87 lb. worth 7*s.* per lb. What quantity muſt there be of each?

Anſ. 14½. *of* 5*s.* 29*lb.* *of* 6*s.* 29*lb.* *of* 8*s.* *and* 14½*lb.* *of* 9*s.*

3. A vintner had four ſorts of wine, *viz.* White Wine, at 4*s.* per gallon; Flemiſh, at 6*s.* per gallon; Malaga at 8*s.* per gallon; and Canary at 10*s.* per gallon: would make a mixture of 60 gallons, to be worth 5*s.* per gallon. What quantity of each muſt he take?

Anſ. 45 *gallons of White Wine,* 5 *gallons of Flemiſh,* 5 *gallons of Malaga, and* 5 *gallons of Canary.*

4. A grocer having four ſorts of currants, of 11*d.* 9*d.* 6*d.* and 4*d.* the pound, is deſirous of making a compoſition of 240*lb.* worth 8*d.* the lb. How much of each muſt he take?

Anſ. 96*lb.* at 11*d.* 48*lb.* at 9*d.* 24*lb.* at 6*d.* and 72*lb.* at 4*d.*

5. A ſilverſmith hath four ſorts of gold, *viz.* of 24 carats fine, of 22, 20, and 15 carats fine; would make as much of each ſort together, ſo as to have 42 oz. of 17 carats fine. How much muſt he take of each?

Anſ. 4 *of* 24, 4 *of* 22, 4 *of* 20, *and* 30 *of* 15 *carats fine.*

6. A druggiſt having ſome drugs of 8*s.* 5*s.* and 4*s.* per lb. made them into two parcels; one of 28 lb. at 6*s.* per lb. the other of 42 lb. at 7*s.* per lb. How much of every ſort did he take for each parcel?

Anſ. 12 *lb. of* 8*s.*	*Anſ.* 30 *lb. of* 8*s.*
8 *lb. of* 5*s.*	6 *lb. of* 5*s.*
8 *lb. of* 4*s.*	6 *lb. of* 4*s.*
28 *lb. at* 6*s. per lb.*	42 *lb. at* 7*s. per lb.*

POSITION, *or the* RULE OF FALSE,

IS a rule that, by falſe or ſuppoſed numbers, taken at pleaſure, diſcovers the true ones required. It is divided into two parts; SINGLE and DOUBLE.

SINGLE POSITION

Is, by uſing one ſuppoſed number, and working with it as the true one, you find the real number required, by the following

RULE. As the total of the errors : to the true total : : ſo is the ſuppoſed number : to the true one required.

PROOF. Add the ſeveral parts of the ſum together, and, if it agrees with the ſum, it is right.

EXAMPLES.

1. A ſchoolmaſter being aſked how many ſcholars he had, ſaid, If I had as many, half as many, and one quarter as many more, I ſhould have 88. How many had he *Anſ.* 32.

Suppoſe he had -	40	As 110 : 88 : : 40	32
as many - -	40	40	32
half as many -	20	—	16
¼ *as many* - -	10	110)3520(	8
	110	32	88 *proof.*

2. A perſon having about him a certain number of Portugal pieces, ſaid, If the third, fourth, and ſixth of them were added together, they would make 54. I deſire to know how many he had? *Anſ.* 72.

3. A gentleman bought a chaiſe, horſe and harneſs, for £60, the horſe came to twice the price of the harneſs, and the chaiſe to twice the price of the horſe and harneſs. What did he give for each?

Anſ. Horſe £13..6..8; *Harneſs* £6..13..4; *Chaiſe* £40.

4. A, B and C, being determined to buy a quantity of goods, which would coſt them £120, agreed amongſt themſelves that B ſhould have a third part more than A, and C a fourth part more than B. I deſire to know what each man muſt pay? *Anſ. A* £30, *B* £40, *C* £50.

5. A man

5. A man overtaking a maid driving a flock of geeſe, ſaid to her, How do you do, ſweetheart; where are you going with theſe 30 geeſe? No, Sir, ſaid ſhe, I have not 30; but if I had as many more, half as many more, and 5 geeſe beſides, I ſhould have 30. How many had ſhe?

Anſ. 10.

6. A perſon delivered to another a ſum of money unknown, to receive intereſt for the ſame at 6 *per cent. per annum*, ſimple intereſt, and at the end of ten years received for principal and intereſt £300. What was the ſum lent?

Anſ. £187..10..–.

DOUBLE POSITION

Is by making uſe of two ſuppoſed numbers, and if both prove falſe, (as it generally happens) they are with their errors to be thus ordered.

RULE 1. Place each error againſt its reſpective poſition.

2. Multiply them croſs-wiſe.

3. If the errors are alike, *i. e.* both greater, or both leſs than the given number, take their difference for a diviſor, and the difference of their products for a dividend. But if unlike, take their ſum for a diviſor, and the ſum of their products for a dividend, the quotient will be the anſwer.

EXAMPLES.

1. A, B and C, would divide £200 between them, ſo that B may have £6 more than A, and C £8 more than B. How much muſt each have?

Suppoſe A had 40 — *Then ſuppoſe A had* 50
then B had 46 — *then B muſt have* 56
and C - - 54 — *and C* - - - - 64

140 *too little by* 60 — 170 *too little by* 30

ſup. errors.

40 X 60
50 X 30

3000 1200
1200

3|0)180|0
60 *Anſ. for A.*

60
30
—
30 *diviſor.*

60 *A*
66 *B*
74 *C*
—
200 *proof.*

2. A man

2. A man had two ſilver cups, of unequal weight, having one cover to both, of 5 oz. now if the cover is put on the leſſer cup, it will double the weight of the greater cup; and ſet on the greater cup, it will be thrice as heavy as the leſſer cup. What is the weight of each cup?

Anſ. 3 *ounces leſſer*; 4 *greater.*

3. A, B and C, playing at hazard together, the money ſtaked was 196 guineas; but diſagreeing, each ſeized as many as he could: A got a certain quantity; B as many as A, and 16 more; and C the 6th part of both their ſums. How many had each?

Anſ. A 76; *B* 92; *and C* 28.

4. A gentleman bought a houſe, with a garden, and a horſe in the ſtable, for £500, now he paid 4 times the price of the horſe for the garden, and 5 times the price of the garden for the houſe. What was the value of the houſe, garden and horſe, ſeparately?

Anſ. horſe, £20, *garden*, 80, *houſe* 400.

5. Three perſons diſcourſed concerning their ages; ſays H, I am 30 years of age; ſays K, I am as old as H, and $\frac{1}{4}$ of L; and ſays L, I am as old as you both. What was the age of each perſon?

Anſ. H 30; *K* 50; *and L* 80.

6. D, E and F, playing at cards, ſtaked 324 crowns; but diſputing about the tricks, each man took as many as he could: D got a certain number; E as many as D, and 15 more; and F got a 5th part of both their ſums added together. How many did each get?

Anſ. D 127$\frac{1}{2}$; *E* 142$\frac{1}{2}$; *and F* 54.

7. A ſtealing apples was taken by B, and to appeaſe him gave him half what he had, and B gives him back 10; going farther, he meets C, who took from him half of what he had left, and gives him back 4: after that, meeting with D, he gives him half of what he had, and he returns him back 1; at laſt, getting ſafe away, he finds he had 13 left. How many had he at firſt? *Anſ.* 60.

8. A gentleman going into a garden, meets with ſome ladies, and ſays to them, Good-morning to you 10 fair maids. Sir, you miſtake, anſwered one of them, we are not 10; but if we were twice as many more as we are, we ſhould be as many above 10 as we are now under. How many were they; *Anſ.* 5.

EXCHANGE.

EXCHANGE

IS the receiving money in one country for the ſame value paid in another.

The Par of Exchange is always fixed and certain, it being the intrinſic value of foreign money, compared with ſterling; but the Courſe of Exchange riſes and falls, upon various occaſions.

I. FRANCE.

They keep their accounts at Paris, Lyons, and Rouen, in Livres, Sols and Deniers, and exchange by the Crown, = 4*s.* 6*d.* at par.

NOTE. 12 *deniers make* 1 *ſol.*
20 *ſols* - - - 1 *livre.*
3 *livres* - - 1 *crown.*

To change French into Sterling.

RULE. As 1 crown : is to the given rate : : ſo is the French ſum : to the ſterling required.

To change Sterling into French.

RULE. As the rate of exchange : is to 1 crown : : ſo is the ſterling ſum : to the French required.

EXAMPLES.

1. How many crowns muſt be paid at Paris, to receive in London £180, exchange at 4*s.* 6*d.* per crown?

d. *c.* £.
As 54 : 1 : : 180 :
240
——— *crowns.*
54)43200(800
432
———
...
———

2. A merchant at Paris remits to his correſpondent in London 800 crowns, at 4*s.* 6*d.* each; what is the value in ſterling?

cr. *d.* *cr.*
1 : 54 : : 800 :
54
———
12)43200
———
20)3600
———
£180

3. How much ſterling muſt be paid in London, to receive in Paris 758 crowns, exchange at 56*d.* per crown?

Anſ. £176..17..4.

4. A merchant

4. A merchant in London remits £176..17..4 to his correſpondent at Paris; what is the value of French crowns, at 56*d.* per crown? *Anſ.* 758

5. Change 725 crowns, 17 ſols, 7 deniers, at 54*d.*½ per crown, into ſterling; what is the ſum? *Anſ.* £164..14..–½.

6. Change £164..14..–½ ſterling into French crowns, exchange at 54*d.*½ per crown?

Anſ. 725 *crowns*, 17 *ſols*, 7 *deniers.*

II. SPAIN.

They keep their accounts at Madrid, Cadiz and Seville, in Dollars, Rials and Maravedies, and exchange by the Piece of Eight = 4*s.* 6*d.* at par.

NOTE. 34 *maravedies make* 1 *rial.*
8 *rials* - - - 1 *piaſtre, or piece of eight.*
10 *rials* - - - 1 *dollar.*

RULE. As with France.

EXAMPLES.

7. A merchant at Cadiz remits to London 2547 pieces of eight, at 56*d.* per piece; how much ſterling is the ſum; *Anſ.* £594..6..–.

8. How many pieces of eight, at 56*d.* each, will anſwer a bill of £594..6. – ſterling? *Anſ.* 2547.

9. If I pay a bill here of £2500 what Spaniſh money may I draw my bill for at Madrid, exchange at 57*d.*½ per piece of eight? *Anſ.* 10434 *pieces of eight*, 6 *rials*, 8 *mar.*

III. ITALY.

They keep their accounts at Genoa and Leghorn in Livres, Sols and Deniers, and exchange by the Piece of Eight, or Dollar = 4*s.* 6*d.* at par.

NOTE. 12 *deniers make* 1 *ſol.*
20 *ſols* - - 1 *livre.*
5 *livres* - - 1 *piece of eight at* Genoa.
6 *livres* - - 1 *piece of eight at* Leghorn.

N. B. The exchange at Florence is by Ducatoons; the exchange at Venice by Ducats.

NOTE. 6 *ſolidi make* 1 *groſs.*
24 *groſſes* - - 1 *ducat.*

RULE. The ſame as before.

10. How

10. How much ſterling money may a perſon receive in London, if he pays in Genoa 976 dollars, at 53*d.* *per* dollar? *Anſ.* £215. 10*s.* 8*d.*

11. A merchant remitted £215. 10*s.* 8*d.* ſterling to Leghorn, how many dollars will he receive there, the exchange being at 53*d.* *per* dollar? *Anſ.* 976.

12. A factor hath ſold goods at Florence, for 250 ducatoons, at 54*d.* each, what is the value in pounds ſterling? *Anſ.* £56. 5*s.*

13. A bill of £56. 5*s.* is remitted to Florence, to be paid in ducatoons, at 54*d.* each, how many will be received? *Anſ.* 250.

14. If 275 ducats, at 4*s.* 5*d.* each, be remitted from Venice to London, what is the value in pounds ſterling? *Anſ.* £60. 14*s.* 7*d.*

15. A gentleman travelling, would exchange £60. 14*s.* 7*d.* ſterling for Venice ducats, at 4*s.* 5*d.* each, how many muſt he receive? *Anſ.* 275.

IV. PORTUGAL.

They keep their accounts in Oporto and Liſbon, in *reas*, and exchange on the *milrea*, = 6*s.* 8*d.* $\frac{1}{2}$ at *par*.

NOTE, 1000 *reas* make 1 *milrea*.

RULE, the ſame as with France.

EXAMPLES.

16. A gentleman being deſirous to remit to his correſpondent in London 2750 milreas, exchange at 6*s.* 5*d.* *per* milrea, how much ſterling will he be creditor for in London? *Anſ.* £882. 5*s.* 10*d.*

17. If a bill be drawn from London of £882. 5*s.* 10*d.* ſterling, how many milreas, at 6*s.* 5*d.* each, is equal in value to the ſaid ſum? *Anſ.* £2750.

18. A merchant at Oporto remits to London 4366 milreas, and 183 reas, at 5*s.* 5*d.* $\frac{5}{8}$ exchange, *per* milrea, how much ſterling muſt be paid in London for this remittance? *Anſ.* £1193. 17*s.* 6*d.* $\frac{3}{4}$.

19. If I pay a bill at London of £1193. 17*s.* 6*d.* $\frac{3}{4}$, what muſt I draw for on my correſpondent at Liſbon, exchange at 5*s.* 5*d.* $\frac{5}{8}$ *per* milrea? *Anſ.* 4366 *milreas* 183 *reas.*

V. HOLLAND, FLANDERS, *and* GERMANY.

They keep their accounts at Antwerp, Amſterdam, Bruſſels, Rotterdam, and Hamburgh; ſome in pounds, ſhillings, and pence, as in England; others in guilders, ſtivers, and pennings; and exchange with us on our pound at 33*s.* 4*d.* Flemiſh, at *par*.

NOTE. 8 *pennings* - *make* - 1 *groat*.
2 *groats or* 16 *pennings* 1 *ſtiver*.
20 *ſtivers* - - - 1 *guilder or florin*.

ALSO

12 *groats or* 6 *ſtivers* - *make* 1 *ſchelling*.
20 *ſchellings or* 6 *guilders* - 1 *pound*.

To change Flemiſh *into* Sterling.

RULE. As the given rate : is to 1 pound : : ſo is the Flemiſh ſum : to the ſterling required.

To change Sterling *into* Flemiſh.

RULE. As £1 ſterling : is to the given rate : : ſo is the ſterling given : to the Flemiſh ſought.

EXAMPLES.

20. Remitted from London to Amſterdam, a bill of £754 .. 10 .. – ſterling, how many pounds Flemiſh is the ſum, the exchange at 33*s.* 6*d.* Flemiſh *per* pound ſterling?
Anſ. £1263 .. 15 .. 9 *Flemiſh*.

21. A merchant at Rotterdam remits £1263 .. 15 .. 9 Flemiſh to be paid in London, how much ſterling money muſt he draw for, the exchange being at 33*s.* 6*d.* Flemiſh *per* pound ſterling? *Anſ.* £754 .. 10 .. –.

22. If I pay in London £852 .. 12 .. 6 ſterling, how many guilders muſt I draw for at Amſterdam, exchange at 34 ſchel. 4 ½ groats Flemiſh *per* pound ſterling?
Anſ. 8792 *guild.* 13 *ſtiv.* 14½ *pennings*.

23. What muſt I draw for at London, if I pay at Amſterdam 8792 guild. 13 ſtiv. 14 ½ pennings, exchange at 34 ſchel. 4 ½ groats *per* pound ſterling?
Anſ. £852 .. 12 .. 6

To convert Bank Money into current, and the contrary.

NOTE. *The* Bank *money is worth more than the* Current. *The difference between the one and the other is called* agio. *and is generally from* 3 *to* 6 per cent. *in favour of the* Bank.

To change Bank *into* Current *money.*

RULE. As 100 guilders Bank : is to 100 with the agio added :: ſo is the Bank given : to the current required.

To change Current *money into* Bank.

RULE. As 100, with the agio added : is to 100 Bank : : ſo is the Current money given : to the Bank required.

24. Change 794 guilders, 15 ſtivers, Current money, into Bank florins, agio $4\frac{3}{8}$ *per cent.*

Anſ. 761 *guilders,* 8 *ſtivers,* 11 *pennings.*

25. Change 761 guilders, 9 ſtivers, Bank, into Current money, agio $4\frac{3}{8}$ *per cent.*

Anſ. 794 *guilders,* 15 *ſtivers,* 4 *pennings.*

VI. IRELAND.

26. A gentleman remits to Ireland £575..15..– ſterling, what will he receive there, the exchange being at 10 *per cent?* *Anſ.* £633 .. 6 .. 6.

27. What muſt be paid in London for a remittance of £633 .. 6 .. 6 Iriſh, exchange at 10 *per cent?*

Anſ. £575 .. 15 .. –.

COMPARISON *of* WEIGHTS *and* MEASURES.

EXAMPLES.

1. If 50 Dutch pence be worth 65 French pence, how many Dutch pence are equal to 350 French pence?

Anſ. $269\frac{15}{65}$.

2. If 12 yards at London make 8 ells at Paris, how many ells at Paris will make 64 yards at London?

Anſ. $42\frac{8}{12}$.

3. If 30lb. at London make 28lb. at Amſterdam, how many lb. at London will be equal to 350lb. at Amſterdam. *Anſ.* 375.

4. If 95lb. Flemiſh make 100lb. Engliſh, how many lb. Engliſh are equal to 275lb. Flemiſh? *Anſ.* 289 $\frac{45}{95}$.

CONJOINED PROPORTION,

IS when the coin, weight, or meaſures of ſeveral countries are compared in the ſame queſtion; or it is linking together a variety of proportions.

When it is required to find how many of the firſt ſort of coin, weight, or meaſure mentioned in the queſtion, are equal to a given quantity of the laſt.

RULE. Place the numbers alternately, beginning at the left-hand, and let the laſt number ſtand on the left-hand; then multiply the firſt row continually for a dividend, and the ſecond for a diviſor.

PROOF. By as many ſingle Rules of Three as the queſtion requires.

EXAMPLES.

1. If 20lb. at London make 23lb. at Antwerp, and 155lb. at Antwerp make 180lb. at Leghorn, how many lb. at London are equal to 72lb. at Leghorn?

Left.	*Right.*	
20	23	20 × 155 × 72 = 223200
155	180	23 × 180 = 4140)223200(53 $\frac{3780}{4140}$.
72		

2. If 12 lb. at London make 10 lb. at Amſterdam, 100 lb. at Amſterdam 120 lb. at Thouloufe, how many lb. at London is equal to 40 lb. at Thouloufe? *Anſ.* 40.

3. If 140 braces at Venice are equal to 150 braces at Leghorn, and 7 braces at Leghorn equal to 4 ells Engliſh, how many braces at Venice are equal to 16 ells Engliſh?

Anſ. 25 $\frac{30}{824}$.

4. If 40 lb. at London make 36 lb. at Amſterdam, and 50 lb. at Amſterdam make 116lb. at Dantzick, how many lb. at London are equal to 130 lb. at Dantzick?

Anſ. 112 $\frac{288}{4176}$.

When

When it is required to find how many of the laſt ſort of coin, weight, or meaſure, mentioned in the queſtion, is equal to a quantity of the firſt.

RULE. Place the numbers alternately, beginning at the left-hand, and let the laſt number ſtand on the right-hand; then multiply the firſt row for a diviſor, and the ſecond for a dividend.

EXAMPLES.

5. If 12 lb. at London make 10 lb. at Amſterdam, 100 lb. at Amſterdam 120 lb. at Thouloufe, how many lb. at Thoulouſe are equal to 40 lb. at London? *Anſ.* 40 *lb.*

6. If 40 lb. at London make 36 lb. at Amſterdam, and 90 lb. at Amſterdam 116 lb. at Dantzick, how many lb. at Dantzick are equal to 122 lb. at London? *Anſ.* 141 $\frac{1872}{3600}$.

PROGRESSION

Conſiſts of TWO PARTS:

ARITHMETICAL *and* GEOMETRICAL.

ARITHMETICAL PROGRESSION

IS when the rank of numbers increaſe or decreaſe regularly by the continual adding or ſubtracting of the equal numbers: As 1, 2, 3, 4, 5, 6, are in Arithmetical Progreſſion by the continual increaſing or adding of one; 11, 9, 7, 5, 3, 1, by the continual decreaſing or ſubtracting of two.

NOTE. *When any ewen number of terms differ by Arithmetical Progreſſion, the ſum of the two* extremes *will be equal to the two* middle *numbers, or any two* means *equally diſtant from the* extremes: *as,* 2, 4, 6, 8, 10, 12, *where* 6 + 8, *the two middle numbers, are* = 12 + 2, *the two extremes, and* = 10 + 4 *the two means,* = 14.

When the number of terms are odd, the double of the middle term *will be equal to the* two extremes, *or if any* two means *equally diſtant from the* middle term; *as,* 1, 2, 3, 4, 5, *where the double of* 3 = 5 + 1 = 2 + 4 = 6.

In Arithmetical Progreſſion five things are to be obſerved, *viz.*

1. The firſt term.
2. The laſt term.
3. The number of terms.
4. The equal difference.
5. The ſum of all the terms.

Any three of which being given, the other two may be found.

The firſt, ſecond, and third terms given to find the fifth.

RULE. Multiply the ſum by the two extremes by half the number of terms, or multiply half the ſum of the two extremes by the whole number of terms, the product is the total of all the terms.

EXAMPLES.

1. How many ſtrokes does the hammer of a clock ſtrike in 12 hours? *Anſ.* 78.

$12+1=13$ *then* $13\times6=78$.

2. A man buys 17 yards of cloth, and gave for the firſt yard 2*s.* and for the laſt 10*s.* what did the 17 yards amount to; *Anſ.* £3 .. 2 .. –.

3. If 100 eggs were placed in a right line, exactly a yard aſunder from one another, and the firſt a yard from a baſket, what length of ground does that man go who gathers up theſe 100 eggs ſingly, returning with every egg to the baſket to put it in? *Anſ.* 5 *miles*, 1300 *yards.*

The firſt, ſecond, and third terms given to find the fourth.

RULE. From the ſecond ſubtract the firſt, the remainder divided by the third leſs one, gives the fourth.

EXAMPLES.

4. A man had eight ſons, the youngeſt was 4 years old, and the eldeſt 32, they increaſe in Arithmetical Progreſſion, what was the common difference of their ages? *Anſ.* 4.

$32-4=28$ *then* $28\div8-1=4$ *common difference.*

5. A man

5. A man is to travel from London to a certain place in 12 days, and to go but 3 miles the firſt day, increaſing every day by an equal exceſs, ſo that the laſt day's journey may be 58 miles, what is the daily increaſe, and how many miles diſtant is that place from London?

Anſ. 5 *daily increaſe.*

Therefore, as 3 *miles in the firſt day's journey,*
3+5= 8 *the ſecond day.*
8+5=13 *the third day, &c.*
The whole diſtance is 366 *miles.*

The firſt, ſecond, and fourth terms given to find the third.

RULE. From the ſecond ſubtract the firſt, the remainder divide by the fourth, and to the quotient add 1, gives the third.

EXAMPLES.

6. A perſon travelling into the country, went 3 miles the firſt day, and increaſed every day by 5 miles, till at laſt he went 58 miles in one day, how many days did he travel? *Anſ.* 12.

58—3=55 *then* 55 ÷ 5=11+1=12 *the number of days.*

7. A man being aſked how many ſons he had, ſaid, that the youngeſt was 4 years old, and the eldeſt 32, and that he increaſed one in his family every four years, how many had he? *Anſ.* 8.

The ſecond, third, and fourth terms given to find the firſt.

RULE. Multiply the fourth by the third made leſs by 1, the product ſubtracted from the ſecond gives the firſt.

EXAMPLES.

8. A man in 10 days went from London to a certain town in the country, every day's journey increaſing the former by 4, and the laſt he went was 46 miles, what was the firſt? *Anſ.* 10 *miles.*

4×10—1=36 *then* 46—36=10, *the firſt day's journey.*

9. A man takes out of his pocket at 8 ſeveral times, ſo many different numbers of ſhillings, every one exceeding the former by 6, the laſt 46, what was the firſt?

Anſ. 4.

The ſecond, third, and fifth given to find the firſt.

RULE. Divide the fifth by the third, and from the quotient ſubtract half the product of the fourth multiplied by the third leſs 1 gives the firſt.

EXAMPLES.

10. A man is to receive £360 at 12 ſeveral payments, each to exceed the former by £4, and is willing to beſtow the firſt payment on any one that can tell him what it is. What will that perſon have for his pains? *Anſ.* £8.

$$360 \div 12 = 30 \text{ then } 30 - \frac{4 \times 12 - 1}{2} = 8 \text{ the firſt payment.}$$

The firſt, third, and fourth given to find the ſecond.

RULE. Subtract the fourth from the product of the third, multiplied by the fourth, that remainder added to the firſt gives the ſecond.

EXAMPLE.

11. What is the laſt number of an Arithmetical Progreſſion, beginning at 6, and continuing by the increaſe of 8 to 20 places? *Anſ.* 158.

$20 \times 8 - 8 = 152$ *then* $152 + 6 = 158$ *the laſt number.*

GEOMETRICAL PROGRESSION

IS the increaſing or decreaſing of any rank of numbers by ſome common ratio; that is, by the continual multiplication or diviſion of ſome equal number: as 2, 4, 8, 16, increaſe by the multiplier 2, and 16, 8, 4, 2, decreaſe by the diviſor 2.

NOTE. *When any number of terms is continued in geometrical progreſſion, the product of the two* extremes *will be equal to any* two means, *equally diſtant from the* extremes: *as* 2, 4, 8, 16, 32, 64, *where* 64×2 *are* $= 4 \times 32$, *and* $8 \times 16 = 128$.

When

When the number of terms is odd, the middle term *multiplied into itſelf will be equal to the* two extremes, *or any* two means, *equally diſtant from the* mean : *as* 2, 4, 8, 16, 32, *where* $2 \times 32 = 4 \times 16 = 8 \times 8 = 64$.

In Geometrical Progreſſion the ſame five things are to be obſerved as in Arithmetical, *viz.*

1. The firſt term.
2. The laſt term.
3. The number of terms.
4. The equal difference or ratio.
5. The ſum of all the terms.

NOTE. *As the laſt term in a long ſeries of numbers is very tedious to come at, by continual multiplication; therefore, for the readier finding it out, there is a ſeries of numbers made uſe of in* Arithmetical Proportion, *called* indices, *beginning with an* unit, *whoſe common difference is* one; *whatever number of* indices *you make uſe of, ſet as many numbers (in ſuch* geometrical proportion *as is given in the queſtion) under them:*

As 1, 2, 3, 4, 5, 6. *Indices.*
2, 4, 8, 16, 32, 64. *Numbers in geometrical proportion.*

But if the firſt term *in* geometrical proportion *be different from the* ratio, *the* indices *muſt begin with a* cypher.

As 0, 1, 2, 3, 4, 5, 6. *Indices.*
1, 2, 4, 8, 16, 32, 64. *Numbers in geometrical proportion.*

When the indices *begin with a* cypher, *the ſum of the* indices *made choice of muſt always be one* leſs *than the number of terms given in the queſtion; for* 1 *in the* indices *is over the ſecond term, and two over the third, &c.*

Add any two of the indices *together, and that ſum will agree with the product of their reſpective terms.*

As in the firſt table of indices $2 + 5 = 7$
Geometrical proportion $4 \times 32 = 128$

Then in the ſecond $2 + 4 = 6$
$4 \times 16 = 64$

In

In any Geometrical Progreſſion proceeding from unity, the ratio being known, to find any remote term, without producing all the intermediate terms.

RULE. Find what figures of the Indices added together would give the exponent of the term wanted; then multiply the numbers ſtanding under ſuch exponent into each other, and it will give the term required.

Note. When the exponent 1 *ſtands over the* ſecond term, *the number of* exponents *muſt be* 1 leſs *than the number of terms.*

EXAMPLES.

1. A man agrees for 12 peaches, to pay only the price of the laſt, reckoning a farthing for the firſt, an halfpenny for the ſecond, &c. doubling the price to the laſt, what muſt he give for them? *Anſ.* £2..2..8.

0, 1, 2, 3, 4, *Exponents.*
1, 2, 4, 8, 16, *No. of terms.*

For 4+4+3=11, *No. of terms leſs* 1.

16=4
16=4
256=8
8=3
4)2048=11 *No. of far.*
12) 512
210)4|2..8
2..2..8

2. A country gentleman going to a fair to buy ſome oxen, meets with a perſon who had 23; he demanded the price of them, was anſwered £16 a piece: the gentleman bids him £15 a piece, and he would buy all: the other tells him it could not be taken; but if he would give what the laſt ox would come to, at a farthing for the firſt, and doubling it to the laſt, he ſhould have all. What was the price of the oxen? *Anſ.* £4369..1..4.

In any Geometrical Progreſſion, not proceeding from unity, the ratio being given, to find any remote term, without producing all the intermediate terms.

RULE. Proceed as in the laſt, only obſerve that every product muſt be divided by the firſt term.

EXAMPLES.

EXAMPLES.

3. A ſum of money is to be divided among 8 perſons, the firſt to have £20, the ſecond £60, and ſo on in triple proportion; what will the laſt have? *Anſ.* £43740.

$$0,\ 1,\ 2,\ 3,\quad 20,\ 60,\ 180,\ 540,\quad \frac{540\times540}{20}=14580 \text{ then } \frac{14580\times60}{20}=43740$$

3+3+1=7, *one leſs than the number of terms.*

4. A gentleman dying left nine ſons, to whom and to his executors he bequeathed his eſtate in manner following: To his executors £50; his youngeſt ſon was to have as much more as the executors; and each ſon to exceed the next younger by as much more; what was the eldeſt ſon's portion? *Anſ.* £25600.

The firſt term ratio, and number of terms given to find the ſum of all the terms.

RULE. Find the laſt term as before, then ſubtract the firſt from it, and divide the remainder by the ratio, leſs one to the quotient of which add the greater, gives the ſum required.

EXAMPLES.

5. A ſervant ſkilled in numbers agreed with a gentleman to ſerve him twelve months, provided he would give him a farthing for his firſt month's ſervice, a penny for the ſecond, and 4*d.* for the third, &c. what did his wages amount to? *Anſ.* £5825..8..5¼.

256×256=65536 *then* 65536×64=4194304

$$0,\ 1,\ 2,\ 3,\ 4,\quad 1,\ 4,\ 16,\ 64,\ 256,\quad \frac{4194304-1}{4-1}=1398101,\ \textit{then}$$

4+4+3=11, *No. of terms leſs* 1.

1398101+4194304=5592405 *farthings.*

6. A man bought a horſe, and by agreement was to give a farthing for the firſt nail, three for the ſecond, &c. there were four ſhoes, and in each ſhoe 8 nails; what was the worth of the horſe? *Anſ.* £9651146816 93..13..4.

7. A certain perſon married his daughter on New-year's day, and gave her huſband 1*s.* towards her portion, promiſing to double it on the firſt day of every month, for one year; what was her portion? *Anſ.* 204..15..–.

8. A laceman

8. A laceman well verſed in numbers agreed with a gentleman to ſell him 22 yards of rich gold brocaded lace, for 2 pins the firſt yard, 6 pins the ſecond, &c. in triple proportion. I deſire to know what he ſold the lace for, if the pins were valued at 100 for a farthing; alſo what the laceman got or loſt by the ſale thereof, ſuppoſing the lace ſtood him in £7 per yard?

Anſwer. *The lace ſold for* £326886..–..9.
Gain £326732..–..9.

PERMUTATION

IS the changing or varying the order of things.

RULE. Multiply all the given terms one into another, and the laſt product will be the number of changes required.

EXAMPLES.

1. How many changes may be rung upon 12 bells; and how long would they be ringing but once over, ſuppoſing 10 changes might be rung in 1 minute, and the year to contain 365 days, 6 hours?

Anſwer.
1×2×3×4×5×6×7×8×9×10×11×12=479001600 *changes, which* ÷ 10=47900160 *minutes; and, if reduced, is* = 91 *years,* 3 *weeks,* 5 *days,* 6 *hours.*

2. A young ſcholar coming into town for the convenience of a good library, demands of a gentleman with whom he lodged, what his diet would coſt for a year; who told him £10, but the ſcholar not being certain what time he ſhould ſtay, aſked him what he muſt give him for ſo long as he could place his family (conſiſting of 6 perſons beſides himſelf) in different poſitions, every day at dinner: the gentleman thinking it would not be long, tells him £5. to which the ſcholar agrees. What time did the ſcholar ſtay with the gentleman? *Anſ.* 5040 *days.*

THE

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TUTOR's ASSISTANT.

PART II.

VULGAR FRACTIONS.

A FRACTION is a part or parts of an unit, and written with two figures, with a line between them, as $\frac{1}{4}$, $\frac{5}{6}$, $\frac{3}{8}$, &c.

The figure above the line is called the numerator, and the under one the denominator; which shews how many parts the unit is divided into; and the numerator shews how many of those parts are meant by the fraction.

There are four sorts of Vulgar Fractions; *proper*, *improper*, *compound* and *mixed*; *viz.*

1. A PROPER FRACTION is when the numerator is less than the denominator, as $\frac{2}{4}$, $\frac{3}{6}$, $\frac{7}{8}$, $\frac{9}{11}$, $\frac{101}{701}$, &c.

2. An IMPROPER FRACTION is when the numerator is equal to, or greater than, the denominator, as $\frac{5}{3}$, $\frac{8}{4}$, $\frac{12}{12}$, $\frac{107}{2}$, &c.

3. A COMPOUND FRACTION is the fraction of a fraction, and known by the word *of*, as $\frac{1}{2}$ *of* $\frac{2}{3}$, *of* $\frac{7}{9}$, *of* $\frac{8}{17}$, *of* $\frac{9}{13}$, &c.

4. A MIXED NUMBER OR FRACTION is composed of a whole number and fraction, as $8\frac{2}{7}$, $17\frac{1}{2}$, $8\frac{71}{97}$, &c.

REDUCTION *of* VULGAR FRACTIONS.

1. *To reduce fractions to a common denominator.*

RULE. Multiply each numerator into all the denominators, except its own, for a new numerator; and all the denominators for a common denominator. Or,

2. Multiply the common denominator by the ſeveral given numerators ſeparately, and divide the product by their ſeveral denominators, the quotients will be the new numerators.

EXAMPLES.

1. Reduce $\frac{2}{4}$ and $\frac{4}{7}$ to a common denominator.

Facit $\frac{14}{28}$, *and* $\frac{16}{28}$.

1ſt. num. *2d. num.*

$2 \times 7 = 14$ $4 \times 4 = 16$ *then* $4 \times 7 = 28$ *den.* $= \frac{14}{28}$, *and* $\frac{16}{28}$.

2. Reduce $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{5}{8}$ to a common denominator.

Facit $\frac{32}{64}$, $\frac{48}{64}$, $\frac{40}{64}$.

3. Reduce $\frac{7}{8}$, $\frac{4}{6}$, $\frac{6}{10}$, and $\frac{6}{7}$ to a common denominator.

Facit $\frac{2940}{3360}$, $\frac{2240}{3360}$, $\frac{3024}{3360}$, $\frac{2880}{3360}$.

4. Reduce $\frac{6}{10}$, $\frac{2}{4}$, $\frac{1}{7}$, $\frac{1}{6}$ to a common denominator.

Facit $\frac{1008}{1680}$, $\frac{840}{1680}$, $\frac{240}{1680}$, $\frac{280}{1680}$.

5. Reduce $\frac{4}{5}$, $\frac{2}{3}$, $\frac{7}{7}$, and $\frac{1}{8}$ to a common denominator.

Facit $\frac{672}{840}$, $\frac{560}{840}$, $\frac{360}{840}$, $\frac{105}{840}$.

6. Reduce $\frac{2}{6}$, $\frac{5}{9}$, $\frac{2}{8}$, and $\frac{3}{5}$ to a common denominator.

Facit $\frac{720}{2160}$, $\frac{1200}{2160}$, $\frac{540}{2160}$, $\frac{1296}{2160}$.

2. *To reduce a vulgar fraction to its loweſt terms.*

RULE. Find a common meaſure by dividing the lower term by the upper, and that diviſor by the remainder following, till nothing remain; the laſt diviſor is the common meaſure? then divide both parts of the fraction by the common meaſure, and the quotient will give the fraction required.

Note, *If the common meaſure happen to be* 1 *the fraction is already in its loweſt term; and when a fraction hath cyphers at the right-hand, it may be abbreviated by cutting them off; as,* $\frac{4}{3}\frac{0}{0}$.

EXAMPLES.

7. Reduce $\frac{24}{32}$ to its loweſt terms.

24)32(1

—

com. meaſure 8)24(3

—

then $8)\frac{24}{32} = \frac{3}{4}$ *Facit.*

8. Reduce

8. Reduce $\frac{30}{125}$ to its loweſt terms. *Facit* $\frac{6}{25}$.
9. Reduce $\frac{208}{676}$ to its loweſt terms. *Facit* $\frac{32}{171}$.
10. Reduce $\frac{192}{576}$ to its loweſt terms. *Facit* $\frac{1}{3}$.
11. Reduce $\frac{825}{1650}$ to its loweſt terms. *Facit* $\frac{55}{64}$.
12. Reduce $\frac{518\frac{1}{2}}{691}$ to its loweſt terms. *Facit* $\frac{3}{4}$.

3. *To reduce a mixed number to an improper fraction.*

RULE. Multiply the whole number by the denominator of the fraction, and to the product add the numerator for a numerator, which place over the denominator.

Note, *To expreſs a whole number fraction-ways, ſet* 1 *for the denominator* [illegible]

EXAMPLES.

13. Reduce $18\frac{3}{7}$ to an improper fraction. *Facit* $\frac{129}{7}$.
$18\times7+3=129$ *new numerator,* $\frac{129}{7}$.
14. Reduce $56\frac{13}{22}$ to an improper fraction. *Facit* $\frac{1245}{22}$.
15. Reduce $183\frac{5}{21}$ to an improper fraction. *Facit* $\frac{3848}{21}$.
16. Reduce $13\frac{4}{5}$ to an improper fraction. *Facit* $\frac{69}{5}$.
17. Reduce $27\frac{2}{9}$ to an improper fraction. *Facit* $\frac{245}{9}$.
18. Reduce $514\frac{5}{16}$ to an improper fraction. *Facit* $\frac{8229}{16}$.

4. *To reduce an improper fraction to its proper terms.*

RULE. Divide the upper term by the lower.

EXAMPLES.

19. Reduce $\frac{129}{7}$ to its proper terms. *Facit* $18\frac{3}{7}$.
$129\div7=18\frac{3}{7}$.
20. Reduce $\frac{1245}{22}$ to its proper terms. *Facit* $56\frac{13}{22}$.
21. Reduce $\frac{3848}{21}$ to its proper terms. *Facit* $183\frac{5}{21}$.
22. Reduce $\frac{69}{5}$ to its proper terms. *Facit* $13\frac{4}{5}$.
23. Reduce $\frac{245}{9}$ to its proper terms. *Facit* $27\frac{2}{9}$.
24. Reduce $\frac{8229}{16}$ to its proper terms. *Facit* $514\frac{5}{16}$.

5. *To reduce a compound fraction to a ſingle one.*

RULE. Multiply all the numerators for a new numerator, and all the denominators for a new denominator.

Reduce the new fraction to its loweſt terms, by RULE 2.

EXAMPLES.

25. Reduce $\frac{2}{3}$ of $\frac{3}{5}$ of $\frac{5}{8}$ to a ſingle fraction.

Facit $\begin{matrix}2\times3\times5=30\\3\times5\times8=120\end{matrix}$ *reduced to the loweſt term* $=\frac{1}{4}$.

26. Reduce $\frac{5}{9}$ of $\frac{4}{7}$ of $\frac{11}{12}$ to a ſingle fraction.

Facit $\frac{220}{756}=\frac{55}{189}$.

27. Reduce $\frac{11}{12}$ of $\frac{13}{14}$ of $\frac{21}{29}$ to a ſingle fraction.

Facit $\frac{3003}{4872}=\frac{143}{232}$.

28. Reduce $\frac{3}{4}$ of $\frac{5}{6}$ of $\frac{9}{10}$ to a ſingle fraction.

Facit $\frac{135}{240}=\frac{9}{16}$.

29. Reduce $\frac{4}{5}$ of $\frac{6}{8}$ of $\frac{7}{9}$ to a ſingle fraction.

Facit $\frac{168}{360}=\frac{7}{15}$.

30. Reduce $\frac{2}{7}$ of $\frac{5}{9}$ of $\frac{8}{10}$ to a ſingle fraction.

Facit $\frac{80}{630}=\frac{8}{63}$.

6. *To reduce fractions of one denomination to the fraction of another,* but greater, *retaining the ſame value.*

RULE. Reduce the given fraction to a compound one, by comparing it with all the denominations between it, and that denomination which you would reduce it to; then reduce that compound fraction to a ſingle one.

EXAMPLES.

31. Reduce $\frac{7}{8}$ of a penny to the fraction of a pound.

Facit $\frac{7}{8}$ of $\frac{1}{12}$ of $\frac{1}{20}=\frac{7}{1920}$.

32. Reduce $\frac{1}{4}$ of a penny to the fraction of a pound.

Facit $\frac{1}{960}$.

33. Reduce $\frac{4}{5}$ of a dwt. to the fraction of a lb. troy.

Facit $\frac{4}{1200}$.

34. Reduce $\frac{4}{7}$ of a lb. avoirdupoiſe to the fraction of an cwt.

Facit $\frac{4}{784}$.

7. *To reduce fractions of one denomination to the fraction of another,* but leſs, *retaining the ſame value.*

RULE. Multiply the numerator by the parts contained in the ſeveral denominations between it, and that you would reduce it to, for a new numerator, and place it over the given denominator.

Reduce the new fraction to its loweſt terms.

EXAMPLES.

EXAMPLES.

35. Reduce $\frac{7}{1920}$ of a pound to the fraction of a penny.
Facit $\frac{7}{8}$.

$7 \times 20 \times 12 = 1680$ $\frac{1680}{1920}$ *reduced to its lowest term* $= \frac{7}{8}$.

36. Reduce $\frac{1}{960}$ of a pound to the fraction of a penny.
Facit $\frac{1}{4}$.

37. Reduce $\frac{4}{1200}$ of a lb. troy to the fraction of a penny-weight. *Facit* $\frac{4}{5}$.

38. Reduce $\frac{4}{784}$ of an cwt. to a fraction of a lb.
Facit $\frac{4}{7}$.

8. *To reduce fractions of one denomination to another of the same value, having the numerator given of the required fraction.*

RULE. As the numerator of the given fraction : is to its denominator : : so is the numerator of the intended fraction : to its denominator.

EXAMPLES.

39. Reduce $\frac{2}{3}$ to a fraction of the same value, whose numerator shall be 12. *As* 2 : 3 : : 12 : 18. *Facit* $\frac{12}{18}$.

40. Reduce $\frac{5}{7}$ to a fraction of the same value, whose numerator shall be 25. *Facit* $\frac{25}{35}$.

41. Reduce $\frac{5}{7}$ to a fraction of the same value, whose numerator shall be 47.
Facit $\frac{47}{65\frac{4}{5}}$.

9. *To reduce fractions of one denomination to another of the same value, having the denominator given of the fraction required.*

RULE. As the denominator of the given fraction : is to its numerator : : so is the denominator of the intended fraction : to its numerator.

EXAMPLES.

42. Reduce $\frac{2}{3}$ to a fraction of the same value, whose denominator shall be 18. *As* 3 : 2 : : 18 : 12. *Facit* $\frac{12}{18}$.

43. Reduce $\frac{5}{7}$ to a fraction of the same value, whose denominator shall be 35. *Facit* $\frac{25}{35}$.

44. Reduce $\frac{5}{7}$ to a fraction of the same value, whose denominator shall be $65\frac{4}{5}$.
Facit $\frac{47}{6\frac{4}{5}}$.

10. *To reduce a mixed fraction to a single one.*

RULE. When the numerator is the integral part, multiply it by the denominator of the fractional part, adding in the numerator of the fractional part for a new numerator; then multiply the denominator of the fraction by the denominator of the fractional part for a new denominator.

EXAMPLES.

45. Reduce $\frac{36\frac{2}{3}}{48}$ to a simple fraction *Facit* $\frac{110}{144}=\frac{55}{72}$.

$36\times3+2=110$ *numerator.*
$48\times3\ \ =144$ *denominator.*

46. Reduce $\frac{23\frac{5}{7}}{38}$ to a simple fraction. *Facit* $\frac{166}{266}=\frac{83}{133}$.

When the denominator is the integral part, multiply it by the denominator of the fractional part, adding in the numerator of the fractional part for a new denominator; then multiply the numerator of the fraction by the denominator of the fractional part for a new numerator.

EXAMPLES.

47. Reduce $\frac{47}{65\frac{4}{5}}$ to a simple fraction. *Facit* $\frac{235}{329}=\frac{5}{7}$.

48. Reduce $\frac{19}{44\frac{1}{3}}$ to a simple fraction. *Facit* $\frac{57}{133}=\frac{3}{7}$.

11. *To find the proper quantity of a fraction in the known parts of an integer.*

RULE. Multiply the numerator by the common parts of the integer, and divide by the denominator.

EXAMPLES.

49. Reduce $\frac{3}{4}$ of a pound sterling to its proper quantity, $3\times20=60\div4=15s$. *Facit* 15*s.*

50. Reduce $\frac{2}{5}$ of a shilling to its proper quantity.
Facit 4*d.* 3*qrs.* $\frac{1}{5}$.

51. Reduce $\frac{4}{7}$ of a lb. avoirdupoise to its proper quantity.
Facit 9 *oz.* 2 *dr.* $\frac{2}{7}$.

52. Reduce $\frac{7}{9}$ of an cwt. to its proper quantity.
Facit 3 *qrs.* 3 *lb.* 12 *dr.* $\frac{4}{9}$.

53. Reduce

53. Reduce $\frac{3}{5}$ of a lb. troy to its proper quantity.
Facit 7 *oz.* 4 *dwt.*

54. Reduce $\frac{5}{9}$ of an ell Engliſh to its proper quantity.
Facit 2 *qrs.* 3 *nails,* $\frac{1}{9}$.

55. Reduce $\frac{4}{5}$ of a mile to its proper quantity.
Facit 6 *furl.* 16 *poles.*

56. Reduce $\frac{3}{8}$ of an acre to its proper quantity.
Facit 2 *roods,* 20 *poles.*

57. Reduce $\frac{6}{7}$ of an hogſhead of wine to its proper quantity.
Facit 54 *gallons.*

58. Reduce $\frac{1}{9}$ of a barrel of beer to its proper quantity.
Facit 12 *gallons.*

59. Reduce $\frac{5}{12}$ of a chaldron of coals to its proper quantity.
Facit 15 *buſhels.*

60. Reduce $\frac{3}{5}$ of a month to its proper time.
Facit 2 *weeks,* 2 *days,* 19 *hours,* $\frac{1}{5}$.

12. *To reduce any given quantity to the fraction of any greater denomination, retaining the ſame value.*

RULE. Reduce the given quantity to the loweſt term mentioned for a numerator, under which ſet the integral part (reduced to the ſame term) for a denominator, and it will give the fraction required.

EXAMPLES.

61. Reduce 15*s.* to the fraction of a pound ſterling.
Facit $\frac{15}{20} = \frac{3}{4}$*l.*

62. Reduce 4*d.* 3 *qrs.* $\frac{1}{5}$ to the fraction of a ſhilling.
Facit $\frac{2}{5}$.

63. Reduce 9 oz. 2 dr. $\frac{2}{7}$ to the fraction of a lb. avoirdupoiſe.
Facit $\frac{4}{7}$.

64. Reduce 3 qrs. 3 lb. 1 oz. 12 dr. $\frac{4}{9}$ to the fraction of an cwt.
Facit $\frac{7}{9}$.

65. Reduce 7 oz. 4 dwt. to the fraction of a lb. troy.
Facit $\frac{3}{5}$.

66. Reduce 2 qrs. 3 nails, $\frac{1}{9}$ to the fraction of an Engliſh ell.
Facit $\frac{5}{9}$.

67. Reduce 6 furl. 16 poles to the fraction of a mile.
Facit $\frac{4}{5}$.

68. Reduce 2 roods 20 poles to the fraction of an acre.
Facit $\frac{5}{8}$.

69. Reduce 54 gallons to the fraction of an hogſhead of wine.
Facit $\frac{6}{7}$.

70. Reduce

70. Reduce 12 gallons to the fraction of a barrel of beer. *Facit* $\frac{1}{3}$.

71. Reduce 15 buſhels to the fraction of a chaldron of coals. *Facit* $\frac{5}{12}$.

72. Reduce 2 weeks, 2 days, 19 hours, $\frac{1}{5}$ to the fraction of a month. *Facit* $\frac{3}{5}$.

ADDITION *of* VULGAR FRACTIONS.

RULE.

REDUCE the given fractions to a common denominator, then add all the numerators together, under which place the common denominator.

EXAMPLES.

1. Add $\frac{2}{3}$ and $\frac{4}{7}$ together. *Facit* $\frac{14}{21}+\frac{12}{21}=\frac{29}{21}=1\frac{8}{21}$.
2. Add $\frac{3}{4}$, $\frac{2}{7}$ and $\frac{5}{6}$ together. - - - - *Facit* $1\frac{146}{168}$.
3. Add $\frac{1}{5}$, $4\frac{1}{3}$ and $\frac{2}{5}$ together. - - - *Facit* $4\frac{70}{75}$.
4. Add $7\frac{2}{3}$ and $\frac{2}{5}$ together. - - - - - *Facit* $8\frac{1}{15}$.
5. Add $\frac{3}{7}$ and $\frac{2}{3}$ of $\frac{3}{4}$ together. - - - - *Facit* $\frac{11}{14}$.
6. Add $5\frac{2}{3}$ $6\frac{7}{8}$ and $4\frac{1}{2}$ together. - - *Facit* $17\frac{1}{24}$.

2. When the fractions are of ſeveral denominations reduce them to their proper quantities, and add as before.

7. Add $\frac{3}{4}$ of a pound to $\frac{5}{6}$ of a ſhilling. *Facit* 15*s.* 10*d.*
8. Add $\frac{1}{2}$ of a penny to $\frac{2}{3}$ of a pound. *Facit* 13*s.* 4*d.*$\frac{1}{2}$.
9. Add $\frac{3}{4}$ of a pound troy to $\frac{1}{6}$ of an ounce.
Facit 9 *oz.* 3 *dwt.* 8 *gr.*
10. Add $\frac{4}{5}$ of a ton to $\frac{5}{6}$ of a lb.
Facit 16 *cwt.* 0 *qr.* 0 *lb.* 13 *oz.* 5 *dr.* $\frac{1}{5}$.
11. Add $\frac{2}{3}$ of a chaldron to $\frac{3}{4}$ of a buſhel.
Facit 24 *buſh.* 3 *pecks.*
12. Add $\frac{1}{6}$ of a yard to $\frac{2}{3}$ of an inch.
Facit 6 *inch.* 2 *bar. c.*

SUBTRACTION *of* VULGAR FRACTIONS.

RULE.

REDUCE the given fractions to a common denominator, then ſubtract the leſs numerator from the greater, and place the remainder over the common denominator.

2. When

2. When the lower fraction is greater than the upper, ſubtract the numerator of the lower fraction from the denominator, and to that difference add the upper numerator, carrying one to the unit's place of the lower whole number.

EXAMPLES.

1. From $\frac{3}{4}$ take $\frac{5}{7}$ $3\times7=21$. $5\times4=20$. $21-20=1$ *num.*
$4\times7=28$ *den.* *Facit* $\frac{1}{28}$.
2. From $\frac{5}{6}$ take $\frac{3}{5}$ of $\frac{5}{8}$. - - - - - - *Facit* $\frac{11}{24}$.
3. From $5\frac{2}{3}$ take $\frac{9}{10}$. - - - - - - *Facit* $4\frac{23}{30}$
4. From $\frac{33}{47}$ take $\frac{3}{5}$. - - - - - - - *Facit* $\frac{429}{235}$
5. From $\frac{19}{20}$ take $\frac{1}{7}$ of $\frac{2}{3}$. - - - - - *Facit* $\frac{115}{140}$
6. From $6\frac{1}{4}$ take $\frac{2}{3}$ of $\frac{1}{4}$. - - - - - *Facit* $63\frac{3}{4}$

3. When the fractions are of ſeveral denominations, reduce them to their proper quantities, and ſubtract as before.

7. From $\frac{3}{4}$ of a pound take $\frac{3}{4}$ of a ſhilling. *Facit* 14*s.* 3*d.*
8. From $\frac{2}{3}$ of a ſhilling take $\frac{1}{2}$ of a penny. *Facit* 7*d.* $\frac{1}{2}$
9. From $\frac{3}{4}$ of a lb. troy take $\frac{1}{6}$ of an ounce.
Facit 8 *oz.* 16 *dwts.* 16 *grs.*
10. From $\frac{4}{5}$ of a ton take $\frac{3}{8}$ of a lb.
Facit 15 *cwt.* 3 *qrs.* 27 *lb.* 2 *oz.* 10 *dr.* $\frac{8}{5}$.
11. From $\frac{2}{3}$ of a chaldron take $\frac{3}{4}$ of a buſhel.
Facit 23 *buſh.* 1 *pk.*
12. From $\frac{1}{6}$ of a yard take $\frac{2}{3}$ of an inch. *Facit* 5 *in.* 1 *b.* *c.*

MULTIPLICATION *of* VULGAR FRACTIONS.

RULE.

PREPARE the given numbers (if they require it) by the rules of Reduction: then multiply the numerators together for a new numerator, and the denominators for a new denominator.

NOTE. *When any number, either whole or mixed, is multiplied by a fraction, the product will be always leſs than the multiplicand, in the ſame proportion as the multiplying fraction is leſs than an unit.*

EXAMPLES.

1. Multiply $\frac{3}{4}$ by $\frac{3}{5}$. *Fa.* $3\times3=9$ *num.* $4\times5=20$ *den.* $=\frac{9}{20}$
2. Multiply $\frac{7}{9}$ by $\frac{2}{3}$. - - - - - - - *Facit* $\frac{14}{27}$.
3. Multiply $48\frac{3}{5}$ by $13\frac{5}{6}$. - - - - - *Facit* $672\frac{9}{10}$.

4. Multiply

4. Multiply $430\frac{6}{10}$ by $18\frac{3}{7}$. - - - *Facit* $7935\frac{24}{70}$.
5. Multiply $\frac{16}{21}$ by $\frac{3}{4}$ of $\frac{5}{7}$ of $\frac{4}{5}$. - - *Facit* $\frac{96}{294}=\frac{16}{49}$.
6. Multiply $\frac{9}{10}$ by $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{5}{6}$. - - *Facit* $\frac{3}{8}$.
7. Multiply $\frac{3}{4}$ of $\frac{2}{3}$ by $\frac{2}{3}$ of $\frac{1}{3}$. - - *Facit* $\frac{1}{9}$.
8. Multiply $\frac{1}{4}$ of $\frac{3}{8}$ by $\frac{5}{7}$. - - - - - *Facit* $\frac{15}{224}$.
9. Multiply $5\frac{6}{7}$ by $\frac{5}{6}$. - - - - - - *Facit* $4\frac{37}{42}$.
10. Multiply 24 by $\frac{2}{3}$. - - - - - - *Facit* 16.
11. Multiply $\frac{3}{4}$ of 9 by $\frac{7}{8}$. - - - - - *Facit* $5\frac{29}{30}$. $\frac{29}{32}$
12. Multiply $9\frac{1}{2}$ by $\frac{2}{6}$. - - - - - *Facit* $3\frac{1}{6}$.

DIVISION *of* VULGAR FRACTIONS.

RULE.

PREPARE the giving numbers (if they require it) by the rules of Reduction, then multiply the denominator of the divisor into the numerator of the dividend for a new numerator, and the numerator of the divisor into the denominator of the dividend for a new denominator.

NOTE. *When any whole number is divided by a fraction less than unity, the quotient will be greater than the dividend: but if any fraction be divided by a whole number greater than unity, the quotient will be less than the dividend.*

EXAMPLES.

1. Divide $\frac{9}{20}$ by $\frac{3}{5}$. $5\times9=45$ *num.* $3\times20=60$ *den.* $\frac{45}{60}=\frac{3}{4}$
2. Divide $\frac{14}{27}$ by $\frac{2}{3}$. - - - - - - - *Facit* $\frac{7}{9}$.
3. Divide $672\frac{9}{30}$ by $13\frac{5}{6}$. - - - - - *Facit* $48\frac{3}{5}$.
4. Divide $7935\frac{24}{70}$ by $18\frac{3}{7}$. - - - *Facit* $430\frac{3}{5}$.
5. Divide $\frac{3}{8}$ by $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{5}{6}$. - - - *Facit* $\frac{9}{16}$.
6. Divide $\frac{2}{3}$ of 16 by $\frac{5}{7}$ of $\frac{3}{4}$. - - - *Facit* $19\frac{41}{45}$.
7. Divide $\frac{1}{2}$ of $\frac{2}{3}$ by $\frac{2}{3}$ of $\frac{3}{4}$. - - - *Facit* $\frac{24}{36}=\frac{2}{3}$.
8. Divide $9\frac{2}{12}$ by $\frac{1}{2}$ of 7. - - - - *Facit* $2\frac{13}{21}$.
9. Divide $\frac{9}{16}$ by $4\frac{1}{2}$. - - - - - - *Facit* $\frac{1}{8}$.
10. Divide 16 by 24. - - - - - - *Facit* $\frac{2}{3}$.
11. Divide $5205\frac{2}{16}$ by $\frac{4}{5}$ of 91. - - *Facit* $71\frac{1}{2}$.
12. Divide $3\frac{1}{6}$ by $9\frac{1}{2}$. - - - - - - *Facit* $\frac{1}{3}$.

The

The SINGLE RULE *of* THREE DIRECT, *in* VULGAR FRACTIONS.

RULE.

REDUCE the numbers as before directed in Reduction, ſo that the firſt and third may be of the ſame name: multiply the numerator of the firſt fraction by the denominator of the ſecond and third, for a new denominator; then multiply the denominator of the firſt fraction by the numerator of the ſecond and third for a new numerator; that fraction will be the anſwer to the queſtion, which reduce to its proper quantity—Or, when the 3 terms are properly reduced, proceed as in the Rule of Three of whole numbers.

EXAMPLES.

1. If $\frac{3}{4}$ of a yard coſt $\frac{5}{8}$ of a £. what will $\frac{9}{10}$ of a yard come to at that rate? *Anſ* $\frac{15}{24}$=15*s.*

$\frac{3}{4}$*yd.* : $\frac{5}{8}$£. :: $\frac{9}{10}$*yd.* : $\frac{15}{24}$£.

for 4×5× 9=180 *num.* *and* 3×8×10=240 *den.* *or* $\frac{5}{8}\times\frac{9}{10}=\frac{45}{80}\ \frac{3}{4})\frac{45}{80}(\frac{15}{20}$

2. If $\frac{5}{6}$ of a yard coſt $\frac{2}{3}$£. what will $\frac{1}{12}$ of a yard coſt? *Anſ.* 14*s.* 8*d.*

3. If $\frac{3}{4}$ of a yard of lawn coſt 7*s.* 3*d.* what will 10 yards $\frac{4}{5}$ coſt? *Anſ.* £4..19..10$\frac{2}{3}$

4. If $\frac{7}{8}$lb. coſt $\frac{3}{4}$*s.* how many pound will $\frac{8}{9}$ of 1*s.* buy? *Anſ.* 1*lb.* $\frac{8}{21}$.

5. If $\frac{3}{5}$ ell of Holland coſt $\frac{1}{3}$£. what will 12 ells $\frac{3}{5}$ coſt at that rate? *Anſ.* £7..–..8$\frac{3}{4}$. $\frac{13}{17}$.

6. If 12 $\frac{1}{2}$ yards of cloth coſt 15*s.* 9*d.* what will 48 $\frac{1}{2}$ coſt at the ſame rate? *Anſ.* £3..–..9$\frac{1}{11}$ $\frac{16}{00}$.

7. If $\frac{9}{10}$ of an cwt. coſt 284*s.* what will 7 cwt. $\frac{1}{2}$ coſt at the ſame rate? *Anſ.* £118..6..8.

8. If 3 yards of broad cloth coſt £2 $\frac{4}{5}$, what will 10 yards $\frac{2}{7}$ coſt? *Anſ.* £9..12..–.

9. If $\frac{1}{4}$ of a yard coſt $\frac{2}{3}$ of a £. what will $\frac{1}{3}$ of an ell Engliſh come to at the ſame rate? *Anſ.* £2.

10. If 1 lb. of cochineal coſt £1..5..–, what will 36 lb. $\frac{7}{10}$ come to? *Anſ.* £45..17..6.

11. If 1 yard of broad cloth coſt 15*s.* $\frac{3}{8}$, what will 4 pieces coſt, each containing 27 yards $\frac{3}{7}$? *Anſ.* £85..14..3$\frac{140}{430}$.

12. Bought 3 pieces $\frac{1}{2}$ of ſilk, each containing 24 ells $\frac{3}{8}$, at 6*s.* –*d.*$\frac{3}{4}$ per ell, I deſire to know what the whole quantity coſt? *Anſ.* £25..17..2$\frac{1}{4}$ $\frac{3}{16}$.

The

The SINGLE RULE *of* THREE INVERSE, *in* VULGAR FRACTIONS.

EXAMPLES.

IF 48 men can build a wall in 24 days $\frac{1}{4}$, how many men can do the ſame in 192 days? *Anſ.* 6 *men* $\frac{48}{768}$.

2. If 25*s.* $\frac{3}{7}$ will pay for the carriage of an cwt. 145 miles $\frac{1}{4}$, how far may 6 cwt. $\frac{1}{2}$ be carried for the ſame money? *Anſ.* 22 *miles* $\frac{0}{290}$.

3. If 3 $\frac{1}{4}$ yard, of cloth, that is 1 $\frac{1}{3}$ yard wide, be ſufficient to make a cloak, how much muſt I have of that ſort which is $\frac{4}{5}$ yard wide, to make another of the ſame bigneſs? *Anſ.* 4 $\frac{7}{8}$ *yards.*

4. If 3 men can do a piece of work in 4 hours $\frac{1}{2}$, in how many hours will 10 men do the ſame work? *Anſ.* 1 *hour* $\frac{7}{20}$.

5. If a penny white loaf weigh 7 oz. when a buſhel of wheat coſt 5*s.* 6*d.* what is the buſhel worth when the penny white loaf weighs but 2 oz. $\frac{1}{2}$? *Anſ.* 15*s.* 4*d.* $\frac{4}{7}$.

6. What quantity of ſhalloon that is $\frac{3}{4}$ yard wide will line 7 $\frac{1}{2}$ yards of cloth that is $\frac{1}{2}$ yard wide? *Anſ.* 15 *yards.*

DOUBLE RULE *of* THREE *in* VULGAR FRACTIONS.

EXAMPLES.

IF a carrier receives £2 $\frac{1}{10}$ for the carriage of 3 cwt. 150 miles, how much ought he to receive for the carriage of 7 cwt. 3 qrs. $\frac{1}{2}$ 50 miles? *Anſ.* £1..16..9.

2. If £100 in 12 months gain £6 intereſt, what principal will gain £3 $\frac{1}{8}$ in 9 months? *Anſ.* £75.

3. If 9 ſtudents ſpend £10 $\frac{7}{9}$ in 18 days, how much will 20 ſtudents ſpend in 30 days? *Anſ.* £39.18.4 $\frac{360}{1458}$.

4. A man and his wife having laboured one day, earned 4*s.* $\frac{5}{8}$ how much muſt they have for 10 days $\frac{1}{2}$, when their two ſons helped them? *Anſ.* £4..17..1 $\frac{1}{2}$.

5. If £50 in 5 months gain £2 $\frac{37}{144}$, what time will £13 $\frac{1}{3}$ require to gain £1 $\frac{1}{12}$? *Anſ.* 9 *months.*

6. If the carriage of 60 cwt. 20 miles coſt £14 $\frac{1}{2}$, what weight can I have carried 30 miles for £5 $\frac{7}{10}$?

Anſ. 15 *cwt.*

THE
TUTOR's ASSISTANT.

PART III.

DECIMAL FRACTIONS.

IN Decimal Fractions the integer or whole thing, as one pound, one yard, one gallon, *&c.* is ſuppoſed to be divided into ten equal parts, and thoſe parts into tenths, and ſo on without end.

So that the denominator of a decimal, being always known to conſiſt of an unit with as many cyphers as the numerator has places, therefore is never ſet down; the parts being only diſtinguiſhed from the whole numbers by a comma prefixed; thus, ,5 which ſtands for $\frac{5}{10}$, ,25 for $\frac{25}{100}$, ,123 for $\frac{123}{1000}$.

But the different value of figures appear plainer by the following table.

Whole numbers.							Decimal parts.						
7	6	5	4	3	2	1	2	3	4	5	6	7
Millions.	*C Thouſands.*	*X Thouſands,*	*Thouſands.*	*Hundreds.*	*Tens.*	*Units.*	*Parts of Tens.*	*Parts of Hundreds.*	*Parts of Thouſands.*	*Parts of X Thouſands.*	*Parts of C Thouſands.*	*Parts of Millions.*

From which it plainly appears, that, as whole numbers increaſe in a ten-fold proportion to the left-hand, decimal parts decreaſe in a ten-fold proportion to the right-hand:

ſo that cyphers placed before decimal parts decreaſe their value, by removing them farther from the comma, or unit's place; thus, ,5 is 5 parts of 10, or $\frac{5}{10}$; ,05 is 5 parts of 100, or $\frac{5}{100}$; ,005 is 5 parts of 1000, or $\frac{5}{1000}$; ,0005 is 5 parts of 10000, or $\frac{5}{10000}$. But cyphers after decimal parts do not alter their value. For ,5 ,50 ,500 *&c.* are each but $\frac{5}{10}$ of the unit.

A FINITE DECIMAL is that which ends at a certain number of places; but an INFINITE is that which no where ends.

A RECURRING DECIMAL is that wherein one or more figures are continually repeated, as 2,75222.

And 52,275275275 is called a COMPOUND RECURRING DECIMAL.

Note. *A finite decimal may be conſidered as infinite, by making cyphers to recur; for they do not alter the value of the decimal.*

In all operations, if the reſult conſiſts of ſeveral nines, reject them, and make the next ſuperior place an unit more; thus for, 26,25999 write 26,6.

In all circulating numbers, daſh the firſt figure; thus, *in* 86,54$\dot{6}$6$\dot{6}$.

ADDITION *of* DECIMALS.

RULE.

IN ſetting down the propoſed numbers to be added great care muſt be taken in placing every figure directly underneath thoſe of the ſame value, whether they be mixed numbers, or pure decimal parts; and to perform which there muſt be a due regard had to the commas, or ſeparating points, which ought always to ſtand in a direct line, one under another, and to the right-hand of them carefully place the decimal parts, according to their reſpective values; then add them as in whole numbers.

EXAMPLES.

1. Add 72,5 + 32,071 + 2,1574 + 371,4 + 2,75. *Facit* 480,8784
2. Add 30,07 + 2,0071 + 59,4 + 3207,1.
3. Add 3,5 + 47,25 + 927,01 + 2,0073 + 1,5.
4. Add 52,75 + 47,21 + 724 + 31,452 + ,3075.
5. Add 3275 + 27,514 + 1,005 + 725 + 7,32.
6. Add 27,5 + 52 + 3,2075 + ,5741 + 2720.

SUBTRACTION *of* DECIMALS.

RULE.

SUBTRACTION of Decimals differs but little from whole numbers, only in placing the numbers, which muſt be carefully obſerved, as in Addition.

EXAMPLES.

1. From ,2754	take ,2371	5. From 571	take 54,72
2. From 2,37	take 1,76	6. From 625	take 76,91
3. From 271	take 215,7	7. From 23,415	take ,3742
4. From 270,2	take 75,4075	8. From ,107	take ,0007

MULTIPLICATION *of* DECIMALS.

RULE.

PLACE the factors, and multiply them as in whole numbers, and from the product towards the right-hand cut off as many places for decimals as there are in both factors together; but if there ſhould not be ſo many places in the product, ſupply the defect with cyphers to the left-hand.

EXAMPLES.

1. Multiply ,2365 by ,2435 *Facit* ,05758775.

2. Multiply 2,071 by 2,27	7. Multiply 27,35 by 7,0071
3. Multiply 27,15 by 25,3	8. Multiply 5,721 by ,0075
4. Multiply 79,347 by 23,15	9. Multiply 2,07 by ,007
5. Multiply 17105 by ,3257	10 Multiply 20,15 by ,2705
6. Multiply 17105 by ,0237	11. Multiply ,907 by ,0025

When any number of decimals is to be multiplied by 10, 100, 1000, &c. it is only removing the ſeparating point in the multiplicand ſo many places towards the right-hand as there are cyphers in the multiplier: thus, ,578 × 10 = 5,78. ,578 × 100 = 57,8. ,578 × 1000 = 578, ,578 × 10000 = 5780.

Contracted MULTIPLICATION *of* DECIMALS.

RULE.

PUT the unit's place of the multiplier under that place of the multiplicand that is intended to be kept in the product; then invert the order of all the other figures, *i. e.* write them all the contrary way; then in multiplying, begin at the figure in the multiplicand, which ſtands over the figure you are then multiplying with, and ſet down the firſt figure of each particular product directly one under the other, and have a due regard to the increaſe ariſing from the figures on the right hand of that figure you begin to multiply at in the multiplicand.

Note, *That in multiplying the figure left out every time next the right-hand in the multiplicand, if the product be* 5, *or upwards, to* 15, *carry* 1; *if* 15, *or upwards, to* 25, *carry* 2; *and if* 25, *or upwards, to* 35, *carry* 3, &c.

EXAMPLES.

12. Multiply 384,672158 by 36,8345, and let there be only four places of decimals in the product.

Facit 14169,2065.

Contracted Way.		*Common Way.*	
384,672158		384,672158	
5438,63		36,8345	
115401647		1923	360790
23080329		15386	88632
3077377		115401	6474
115402		3077377	264
15387		23080329	48
1923		115401647	4
14169,2065		14169,2066	038510

13. Multiply 3,141592 by 52,7438, and leave only 4 places of decimals. *Facit* 165,6994.

14. Multiply 2,38645 by 8,2175, and leave only 4 places of decimals. *Facit* 19,6107.

15. Multiply 375,13758 by 16,7324, and let there be only 1 place of decimals. *Facit* 6276,9.

16. Multiply 375,13758 by 16,7324, and leave only 4 places of decimals. *Facit* 6276,9520.

17. Multiply 395,3756 by ,75642, and let there be only 4 places of decimals. *Facit* 299,0699.

DIVISION

DIVISION *of* DECIMALS.

THIS Rule is alſo worked as in whole numbers: the only difficulty is in valuing the quotient which is done by any of the following Rules.

RULE 1. The firſt figure in the quotient is always of the ſame value with that figure of the dividend, which anſwers or ſtands over the place of units in the diviſor.

2. The quotient muſt have always ſo many decimal places, as the dividend has more than the diviſor.

NOTE 1. *If the diviſor and dividend have both the ſame number of decimal parts, the quotient will be a whole number.*

2. *If the dividend hath not ſo many places of decimals as are in the diviſor, then ſo many cyphers muſt be annexed to the dividend as will make them equal, and the quotient will then be a whole number.*

3. *But if, when the diviſion is done, the quotient has not ſo many figures as it ſhould have places of decimals, then ſo many cyphers muſt be prefixed as there are places wanting.*

EXAMPLES.

1. Divide 85643,825 by 6,321. *Facit* 13549,

2. Divide 48 by 144.
3. Divide 217,75 by 65.
4. Divide 125 by ,1045.
5. Divide ,709 by 2,574.
6. Divide 5,714 by 8725.
7. Divide 7382,54 by 6,4252.
8. Divide ,08516438 by 423.
9. Divide 267,15975 by 13,25.
10. Divide 72,1564 by ,1347.
11. Divide 715 by ,3075.

When numbers are to be divided by 10, 100, 1000, 10,000, &c. it is performed by placing the ſeparating point in the dividend, ſo many places towards the left-hand, as there are cyphers in the diviſor.

Thus, 5784÷ 10=578,4 5784÷ 1000=5,784.
5784÷ 100=57,84 5784÷ 10000=,5784.

Contracted DIVISION *of* DECIMALS.

RULE.

BY the first rule find what is the value of the first figure in the quotient; then by knowing the first figure's denomination, the decimal places may be reduced to any number, by taking as many of the left-hand figures of the dividend as will answer them; and, in dividing, omit one figure of the divisor at each following operation.

Note, *That in multiplying every figure left out in the divisor, you must carry* 1, *if it be* 5, *or upwards, to* 15; *if* 15, *or upwards, to* 25, *carry* 2; *if* 25, *or upwards, to* 35, *carry* 3, &c.

EXAMPLES.

12. Divide 721,17562 by 2,257432, and let there be only three places of decimals in the quotient.

Contracted.

2,257432)721,17562(319,467
.....6772296

439460.
225743.

213717..
203169..

10548...
9030...

1518....
1354....

164.....
158.....

6

Common Way.

2,257432)721,17562(319,467
6772296

439460 2
225743 2

213717 00
203168 88

10548 120
9029 728

1518 3920
1354 4592

163 93280
158 02024

5 91256

13. Divide 8,758615 by 5,2714167.
14. Divide 51717591 by 8,7586.
15. Divide 25,1367 by 217,35.
16. Divide 51,47549 by ,123415.
17. Divide 70,23-- by 7,9863.
18. Divide 27,104- by 3,712.

REDUCTION

REDUCTION *of* DECIMALS.

To reduce a Vulgar Fraction to a Decimal.

RULE.

ADD cyphers to the numerator, and divide by the denominator, the quotient is the decimal fraction required.

EXAMPLES.

1. Reduce $\frac{1}{4}$ ----- to a decimal. 4)1,00(,25 *Facit.*
2. Reduce $\frac{1}{2}$ ----- to a decimal. *Facit* ,5.
3. Reduce $\frac{3}{4}$ ----- to a decimal. *Facit* ,75.
4. Reduce $\frac{1}{8}$ ----- to a decimal. *Facit* ,375.
5. Reduce $\frac{5}{26}$ ----- to a decimal. *Facit* ,1923076+.
6. Reduce $\frac{11}{14}$ of $\frac{10}{13}$ to a decimal. *Facit* ,6043956+.

Note, *If the given parts are of several denominations, they may be reduced either by so many distinct operations, as there are different parts, or by first reducing them into their lowest denomination, and then divide as before*; or,

2dly, *Bring the lowest into decimals of the next superior denomination, and on the right-hand of the decimal found, place the parts given of the next superior denomination*; *so proceeding till you bring out the decimal parts of the highest integer required, by still dividing the product by the next superior denominator*; or,

3dly, *To reduce shillings, pence and farthings. If the number of shillings be even, take half for the first place of decimals, and let the second and third places be filled up with the farthings contained in the remaining pence and farthings, always remembering to add* 1, *when it is or exceeds* 25: *But if the number of shillings be odd, the second place of decimals must be increased by* 5.

7. Reduce 5*s.* to the decimal of a £. *Facit* ,25.
8. Reduce 9*s.* to the decimal of a £. *Facit* ,45.
9. Reduce 16*s.* to the decimal of a £. *Facit* ,8.

10. Reduce

10. Reduce 8*s*. 4*d*. to the decimal of a £. *Facit* ,4166.

11. Reduce 16*s*. 7*d*. $\frac{3}{4}$ to the decimal of a £.
Facit ,8322916.

first.	*second.*	*third.*	
16*s* 7*d*. $\frac{3}{4}$.	4)3,00	2)16	$7\frac{3}{4}$
12			4
199	12)7,75	,832	32
4	2,0)16,64583		
960)799(.8322916		,8322916	

12. Reduce 19*s*. 5*d*. $\frac{1}{2}$ to the decimal of a £.
Facit ,972916.

13. Reduce 12 grains to the decimal of a lb. Troy.
Facit ,002083.

14. Reduce 12 drams to the decimal of a lb. Avoirdupoise.
Facit ,046875.

15. Reduce 2 qrs. 14 lb. to the decimal of an cwt.
Facit ,625.

16. Reduce 2 furlongs to the decimal of a league.
Facit ,0833.

17. Reduce 2 quarts, 1 pint, to the decimal of a gallon.
Facit ,625.

18. Reduce 4 gallons, 2 quarts of wine, to the decimal of an hogshead. *Facit* ,071428+.

19. Reduce 2 gallons, 1 quart of beer, to the decimal of a barrel. *Facit* ,0625.

20. Reduce 52 days to the decimal of a year.
Facit ,142465+.

To find the value of any Decimal Fraction, *in the known Parts of an* Integer.

RULE. Multiply the decimal given, by the number of parts of the next inferior denomination, cutting off the decimals from the product; then multiply the remainder by the next inferior denomination; thus proceeding, till you have brought in the leaſt known parts of an integer.

EXAMPLES.

21. What is the value of ,8322916 of a £. *Anſ.* 16*s.* 7*d.* ½ +.

20

16,6458320

12

7,7499840

4

½,9999360

22. What is the value of ,002084 of a lb. Troy?
Anſ. 12,00384 *qrs.*

23. What is the value of ,046875 of a lb. Avoirdupoiſe?
Anſ. 12 *drams.*

24. What is the value of ,625 of a cwt.?
Anſ. 2 *qrs.* 14 *lb.*

25. What is the value of ,625 of a gallon?
Anſ. 2 *qrs.* 1 *pint.*

26. What is the value of ,071428 of a hogſhead of wine? *Anſ.* 4 *gallons*, 1 *quart*, ,999856.

27. What is the value of ,0625 of a barrel of beer?
Anſ. 2 *gallons*, 1 *quart.*

28. What is the value of ,142465 of a year?
Anſ. 51,999725 *days.*

Decimal

Decimal TABLES of Coin, Weight and Measure.

TABLE I
ENGLISH COIN.
£1 the Integer.

Sh.	dec.	h.	dec.
19	,95	9	,45
18	,9	8	,4
17	,85	7	,35
16	,8	6	,3
15	,75	5	,25
14	,7	4	,2
13	,65	3	,15
12	,6	2	,1
11	,55	1	,05
10	,5		

Pence.	Decimals
6	,025
5	,020833
4	,016666
3	,0125
2	,008333
1	,004166

Farthings.	Decimals.
3	,003125
2	,0020833
1	,0010416

TABLE II.
ENG. COIN. 1 *Sh.* Long Meaſ. 1 *Foot* the Integer.

Pence and Inches	Decimals.
6	,5
5	,416666
4	,333333
3	,25
2	,166666
1	,083333

Farthings.	Decimals.
3	,0625
2	,041666
1	,020833

TABLE III.
TROY WEIGHT.
1 lb the Integer.
Ounces the ſame as Pence in the laſt Table.

Penny-weight.	Decimals.
10	,041666
9	,0375
8	,033333
7	,029166
6	,025
5	,020833
4	,016666
3	,0125
2	,008333
1	,004166

Grains.	Decimals.
12	,002083
11	,001910
10	,001736
9	,001562
8	,001389
7	,001215
6	,001042
5	,000868
4	,000694
3	,000521
2	,000347
1	,000173

1 Oz. the Integer.
Penny-weights the ſame as Shillings in the firſt Table.

Grains.	Decimals.
12	,025
11	,022916
10	,020833
9	,01875
8	,016666
7	,014583
6	,0125
5	,010416
4	,008333
3	,00625
2	,004166
1	,002083

TABLE IV.
AVOIRDUP. WT.
112lb. the Integer.

Qrs.	Decimals.
3	,75
2	,5
1	,25

Pounds.	Decimals.
14	,125
13	,116071
12	,107143
11	,098214
10	,089286
9	,080357
8	,071428
7	,0625
6	,053571
5	,044643
4	,035714
3	,026786
2	,017857
1	,008928

Ounces.	Decimals.
8	,004464
7	,003906

6	,003348
5	,002790
4	,002232
3	,001674
2	,001116
1	,000558

¼ Oz.	Decimals
3	,000418
2	,000279
1	,000139

TABLE V.

AVOIRDUP. WT.

1 lb. the Integer.

Ounces.	Decimals
8	,5
7	,4375
6	,375
5	,3125
4	,25
3	,1875
2	,125
1	,0625

Drams.	Decimals
8	,03215
7	,027343
6	,023437
5	,019531
4	,015625
3	,011718
2	,007812
1	,003906

TABLE VI.

LIQUID MEAS.

1 Tun the Integer.

Gallons.	Decimals
100	,396825
90	,357141
80	,317460
70	,27
60	,238095
50	,198412
40	,158730
30	,119047
20	,079365
10	,039682
9	,035714
8	,031746
7	,027
6	,023809
5	,019841
4	,015873
3	,011904
2	,007936
1	,003968

Pints.	Decimals
4	,001984
3	,001488
2	,000992
1	,000496

A Hogshead the Integer.

Gallons.	Decimals
30	,476190
20	,317460
10	,158730
9	,142857
8	,126984
7	,111111
6	,095238
5	,079365
4	,063492
3	,047619
2	,031746
1	,015873

Pints.	Decimals
3	,005952
2	,003968
1	,001984

TABLE VII.

MEASURE

Liquid. *Dry.*

1 *Gallon*, 1 *Quarter*

Integer.

Pints.	Decim.	Bush.
4	,5	4
3	,375	3
2	,25	2
2	,125	1

2 pt.	Decim.	Peck
3	,0037[illegible]	3
2	,0[illegible]	2
1	,03125	1

Decimals.	2 Pks.
,0234375	3
,015625	2
,0078125	1

Decimals.	Pints.
,005859	3
,003906	2
,001953	1

TABLE VIII.

LONG MEASURE

1 Mile the Integer.

Yards.	Decimals.
1000	,568182
900	,511364
800	,454545
700	,397727
600	,340000

500	,284091
400	,227272
300	,170454
200	,113636
100	,056818
90	,051136
80	,045454
70	,039773
60	,034091
50	,028409
40	,022727
30	,017045
20	,011364
10	,005682
9	,005114
8	,004545
7	,003977
6	,003409
5	,002841
4	,002273
3	,001704
2	,001136
1	,000568

Feet.	*Decimals.*
2	,0003787
1	,0001894

Inches.	*Decimals.*
6	,0000947
3	,0000474
1	,0000158

TABLE IX.
TIME.

1 Year the Integer.
Months the same as Pence in the second Table.

Days.	*Decimals.*
365	1,000000
300	,821918
200	,547945
100	,273973
90	,246575
80	,219178
70	,191781
60	,164383
50	,136986
40	,109589
30	,082192
20	,054794
10	,027397
9	,024657
8	,021918
7	,019178
6	,016438
5	,013698
4	,010959
3	,008219
2	,005479
1	,002739

1 Day the Integer.

Hours.	*Decimals*
12	,5
11	,458333
10	,416666
9	,375
8	,333333
7	,291666
6	,25
5	,208333
4	,166666
3	,125
2	,083333
1	,041666

Minutes	*Decimals*
30	,020833
20	,013888
10	,006944
9	,00625
8	,005555
7	,004861
6	,004166
5	,003472
4	,002777
3	,002083
2	,001388
1	,000694

TABLE X.
CLOTH MEASURE.

1 Yard the Integer.
Qrs. the same as Table 4.

Nails.	*Decimals.*
2	,125
1	,0625

TABLE XI.
LEAD WEIGHT.

A Fother the Integ.

Hund.	*Decimals*
10	,512820
9	,461538
8	,410256
7	,358974
6	,307692
5	,256410
4	,205128
3	,153846
2	,102564
1	,051282

Qrs.	*Decimals.*
2	,025641
1	,012820

Pounds.	*Decimals.*
14	,0064102
13	,0059523
12	,0054945
11	,0050366
10	,0045787
9	,0041208
8	,0036630
7	,0032051
6	,0027472
5	,0022893
4	,0018315
3	,0013736
2	,0009157
1	,0004578

The RULE *of* THREE *in* DECIMALS.

EXAMPLES.

IF 26 ½ yards coſt £3 .. 16 .. 3, what will 32 ¼ yards come to? *Anſ.* £4..12..9½.

Yds.	£.	*Yds.*
26,5 :	3,8125 ::	32,25 :
	32,25	

26,5)122,953125(4,63974=£4..12..9½.

2. What will the pay of 540 men come to at £1..5..6 per man? *Anſ.* £688..10..–.

3. If 7 ¼ yards of cloth coſt £2..12..9, what will 140½ yards of the ſame coſt? *Anſ.* £47..16..3..2,4 *qrs.*

4. If a cheſt of ſugar, weighing 7 cwt. 2 qrs. 14 lb. coſt £36..12..9, what will 2 cwt. 1 qr. 21 lb. of the ſame coſt? *Anſ.* £11..14..2..3,5 *qrs.*

5. A grocer buys 24 ton, 12 cwt. 2 qrs. 14 lb. 12 oz. of tobacco for £3678..6..4, what will 1 oz. come to? *Anſ.* 1*d.*

6. What will 326 lb. 1 qr. of tobacco come to, when 1lb½. is ſold for 3*s.* 6*d.*? *Anſ.* £38..1..3.

7. What is the worth of 19 oz. 3 dwt. 5 gr. of gold, at £2..19..– per oz.? *Anſ.* £56..10..5..2,99*qrs.*

8. What is the worth of 827 ¾ yards of painting, at 10*d.*½ per yard? *Anſ.* £36..4..3..1,5 *qrs.*

9. If I lent my friend £34 for ⅝ of a year, how much ought he to lend me 1½ of a year to requite my kindneſs? *Anſ.* £51.

10. If ¾ of a yard of cloth, that is 2 yards ¼ broad, make a garment, how much that is ⅘ of a yard wide will make the ſame? *Anſ.* 2,109375 *yards.*

11. If one ounce of ſilver coſt 5*s.* 6*d.* what is the price of a tankard that weighs 1 lb. 10 oz. 10 dwt. 4 grs.?
Anſ. £6..3..9..2,2 *qrs.*

12. If 1 lb. of tobacco coſt 15*d.* what coſt 3 hogſheads, weighing together 15 cwt. 1 qr. 19 lb.?
Anſ. £107..18..10.

13. If 1 cwt. of currants coſt £2..9..9, what will 45 cwt. 3qrs. 14lb. coſt at the ſame rate? *Anſ.* £113..10..9. 3*qrs.*

14. Bought 6 cheſts of ſugar, each 6 cwt. 3 qrs. at £2..16..– *per* cwt. what do they come to? *Anſ.* £113..8..–.

15. Bought a tankard for £10..12..–, at the rate of 5*s.* 4*d.* *per* ounce, what was the weight? *Anſ.* 39 *oz.* 15 *dwt.*

16. Gave £187..3..3. for 25 cwt. 3 qrs. 14lb. of tobacco, at what rate did I buy it at *per* lb.? *Anſ.* 15*d.* 2*qrs.*

17. Bought 29 lb. 4 oz. of coffee for £10..11..3, what is the value of 3 lb.? *Anſ.* £1..1..8.

18. If I gave 1*s.* 1*d.* for 3 lb. ½ of cheeſe, what will be the value of 1 cwt.? *Anſ.* £1..14..8.

EXTRACTION *of the* SQUARE ROOT.

EXTRACTING the Square Root is to find out ſuch a number as being multiplied into itſelf, the product will be equal to the given number.

RULE. *Firſt*, Point the given number, beginning at the unit's place, then to the hundreds, and ſo upon every ſecond figure throughout.

Secondly, Seek the greateſt ſquare number in the firſt point towards the left hand, placing the ſquare number under the firſt point, and the root thereof in the quotient; ſubtract the ſquare number from the firſt point, and to the remainder bring down the next point, and call that the Reſolvend.

Thirdly, Double the quotient, and place it for a diviſor on the left hand of the reſolvend; ſeek how often the diviſor is contained in the reſolvend (preſerving always the unit's place), and put the anſwer in the quotient, and alſo on the right-hand ſide of the diviſor; then multiply by the figure laſt put in the quotient, and ſubtract the product from the reſolvend; bring down the next point to the remainder (if there be any more) and proceed as before.

ROOTS.	1.	2.	3.	4.	5.	6.	7.	8.	9.
SQUARES,	1.	4.	9.	16.	25.	36.	49.	64.	81.

EXAMPLES.

EXAMPLES.

1. What is the ſquare root of 119025.? *Anſ.* 345.

119025(345
9
---
64)290
256
---
685)3425
3425

2. What is the ſquare root of 106929? *Anſ.* 327.
3. What is the ſquare root of 2268741? *Anſ.* 1506,23+.
4. What is the ſquare root of 7596796? *Anſ.* 2756,228+.
5. What is the ſquare root of 36372961? *Anſ.* 6031.
6. What is the ſquare root of 22071204? *Anſ.* 4693.

When the given number conſiſts of a whole number, and decimals together, make the number of decimals even, by adding cyphers to them; ſo that there may be a point fall on the unit's place of the whole number.

7. What is the ſquare root of 3271,4007? *Anſ.* 57,19 +
8. What is the ſquare root of 4795,25731? *Anſ.* 69,247 +
9. What is the ſquare root of 4,372594? *Anſ.* 2,091 +
10. What is the ſquare root of 2,2710957? *Anſ.* 1,50701 +
11. What is the ſquare root of ,00032754? *Anſ.* ,018c9 +
12. What is the ſquare root of 1,270054? *Anſ.* 1,1269 +

To Extract the Square Root *of a* VULGAR FRACTION.

RULE. Reduce the fraction to its loweſt terms; then extract the ſquare root of the numerator for a new numerator, and the ſquare root of the denominator for a new denominator.

If the fraction be a ſurd (i. e.) *a number where a root can never be exactly found, reduce it to a decimal, and extract the root from it.*

EXAMPLES.

13. What is the ſquare root of $\frac{2304}{5184}$? *Anſ.* $\frac{2}{3}$.
14. What is the ſquare root of $\frac{2704}{4225}$? *Anſ.* $\frac{4}{5}$.
15. What is the ſquare root of $\frac{9216}{12544}$? *Anſ.* $\frac{6}{7}$.

SURDS.

16. What is the ſquare root of $\frac{27}{3}\frac{5}{0}$? *Anſ.* ,89802+
17. What is the ſquare root of $\frac{3}{4}\frac{5}{7}\frac{7}{6}$? *Anſ.* ,86602+
18. What is the ſquare root of $\frac{4}{5}\frac{7}{4}\frac{8}{9}$? *Anſ.* ,93308+

To Extract the Square Root *of a* MIXED NUMBER.

RULE. Reduce the fractional part of the mixed number to its loweſt term, and then the mixed number to an improper fraction.

2. Extract the roots of the numerator and denominator for a new numerator and denominator.

If the mixed number given be a ſurd, reduce the fractional part to a decimal, annex it to the whole number, and extract the ſquare root therefrom.

EXAMPLES.

19. What is the ſquare root of $51\frac{21}{25}$? *Anſ.* $7\frac{1}{5}$.
20. What is the ſquare root of $27\frac{9}{16}$? *Anſ.* $5\frac{1}{4}$.
21. What is the ſquare root of $9\frac{4}{49}$? *Anſ.* $3\frac{1}{7}$.

SURDS.

22. What is the ſquare root of $85\frac{14}{15}$? *Anſ.* 9,27 +
23. What is the ſquare root of $8\frac{5}{7}$? *Anſ.* 2,9519 +
24. What is the ſquare root of $6\frac{2}{3}$? *Anſ.* 2,5298 +

The APPLICATION.

1. There is an army conſiſting of a certain number of men, who are placed rank and file (that is, in the form of a ſquare, each ſide having 576 men) I deſire to know how many the whole ſquare contains? *Anſ.* 331776.

2. A certain pavement is made exactly ſquare, each ſide of which contains 97 feet. I demand how many ſquare feet are contained therein. *Anſ.* 9409.

To find a mean proportional between any two given numbers.

RULE. The ſquare root of the product of the given numbers is the mean proportional ſought.

EXAMPLES.

EXAMPLES.

27. What is the mean proportional between 3 and 12?
Anſ. $3 \times 12 = 36$ *then* $\sqrt{36} = 6$ *the mean proportional.*

28. What is the mean proportional between 4276 and 842? *Anſ.* 1897,4+

To find the ſide of a ſquare equal in area to any given ſuperficies.

RULE. The ſquare root of the content of any given ſuperficies, is the ſquare equal ſought.

EXAMPLES.

29. If the content of a given circle be 160, what is the ſide of the ſquare? *Anſ.* 12,64911.

30. If the area of a circle is 750, what is the ſide of the ſquare equal? *Anſ.* 27,38612.

The area of a circle given to find the diameter.

RULE. As 355 : 452, or, as 1 : 1,273239 : : ſo is the area : to the ſquare of the diameter;—or, multiply the ſquare root of the area, by 1, 12837, and the product will be the diameter.

EXAMPLE.

31. What length of cord will be fit to tie a cow's tail, the other end fixed in the ground, to let her have liberty of eating an acre of graſs, and no more, ſuppoſing the cow and tail to be 5 yards $\frac{1}{2}$? *Anſ.* 6, 136 *perches.*

The area of a circle given to find the periphery, or circumference.

RULE. As 113 : 1420, or, as 1 : 12,56637 : : the area to the ſquare of the periphery : —or, multiply the ſquare root of the area by 3,5449, and the product is the circumference.

EXAMPLES.

32. When the area is 12, what is the circumference?
Anſ. 12,2798.

33. When the area is 160, what is the periphery?
Anſ. 44,839.

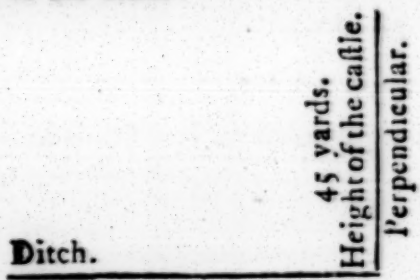
Any two ſides of a right angled triangle given to find the third ſide.

1. *The baſe and perpendicular given to find the hypothenuſe.*

RULE. The ſquare root of the ſum of the ſquares of the baſe and perpendicular is the length of the hypothenuſe.

EXAMPLES.

34. The top of a caſtle from the ground is 45 yards high, and ſurrounded with a ditch 60 yards broad; what length muſt a ladder be to reach from the outſide of the ditch to the top of the caſtle? *Anſ.* 75 *yards.*



35. The walls of a town is 25 feet high, which is ſurrounded by a moat of 30 feet in breadth; I deſire to know the length of a ladder that will reach from the outſide of the moat to the top of the wall? *Anſ.* 39,05 *feet.*

The hypothenuſe and perpendicular given to find the baſe.

RULE. The ſquare root of the difference of the ſquares of the hypothenuſe and perpendicular is the length of the baſe.

The baſe and hypothenuſe given to find the perpendicular.

RULE. The ſquare root of the difference of the ſquares of the hypothenuſe and baſe is the height of the perpendicular.

N. B. *The two laſt queſtions may be varied for examples to the two laſt propoſitions.*

Any number of men being given to form them into a ſquare battle, or to find the number of ranks and files.

RULE. The ſquare root of the number of men given, is the number of men either in rank or file.

36. An army conſiſting of 331776 men, I deſire to know how many rank and file? *Anſ.* 576.

37. A certain ſquare pavement contains 48841 ſquare ſtones, all of the ſame ſize. I demand how many are contained in one of the ſides? *Anſ.* 221.

EXTRACTION

EXTRACTION *of the* CUBE ROOT.

TO extract the Cube Root is to find out a number, which being multiplied into itself, and then into that product, produceth the given number.

RULE 1. Point every third figure of the cube given, beginning at the unit's place; seek the greatest cube to the first point, and subtract it therefrom; put the root in the quotient, and bring down the figures in the next point to the remainder for a RESOLVEND.

2. Find a DIVISOR by multiplying the square of the quotient by 3. See how often it is contained in the resolvend, rejecting the units and tens, and put the answer in the quotient.

3 To find the SUBTRAHEND. 1. Cube the last figure in the quotient. 2. Multiply all the figures in the quotient by 3, except the last, and that product by the square of the last. 3. Multiply the divisor by the last figure. Add these products together, gives the subtrahend, which subtract from the resolvend; to the remainder bring down the next point, and proceed as before.

ROOTS.	1.	2.	3.	4.	5.	6.	7.	8.	9.
CUBES.	1.	8.	27.	64.	125.	216.	343.	512.	729.

EXAMPLES.

1. What is the cube root of 99252847?

```
                 .   .   .
                 99252847(463
                 64 = cube of 4
          Divisor.
Square of 4×3=48)35252 resolvend.
                  216 = cube of 6.
                 432  =4×3× by square of 6.
                288   =divisor × by 6.
                 33336 subtrahend.
          Divisor.
Square of 46×3=6348)1916847 resolvend.
                      27 = cube of 3.
                    1242 = 46 × 3 × by square of 3.
                   19044 = divisor × by 3.
                   1916847 subtrahend.
```

Another

Another NEW *and more* CONCISE METHOD *of extracting the* CUBE ROOT.

RULE 1. Point every third figure of the cube given, beginning at the unit's place, then find the higheſt cube to the firſt point, and ſubtract it therefrom, put the root in the quotient, bring down the figures in the next point to the remainder for a reſolvend.

2. Square the quotient and triple the ſquare for a diviſor, *As* $4\times4\times3=48$. Find how often it is contained in the reſolvend, rejecting units and tens, and put the anſwer in the quotient.

3. Square the laſt figure in the quotient, and put it on the right-hand of the diviſor.

As $6\times6=36$ put to the diviſor $48=4836$.

4. Triple the laſt figure in the quotient and multiply by the former, put it under the other, units under the tens, add them together, and multiply the ſum by the laſt figure in the quotient, ſubtract that product from the reſolvend, bring down the next point, and proceed as before.

EXAMPLES.

1. What is the cube root of 99252847?

Square of $4\times3=48$ *diviſor.*
Square of 6 *put to* $48=4836$
$6\times3\times4=72$
$5556\times6=$

Square of $46=2116\times3=6348$ *diviſor.*
Square of $3=9$ *put to* $6348=634809$
$3\times3\times46=414$
$638949\times3=1916847$

99252847(463
64
35252
33336
1916847

2. What is the cube root of 389017? *Anſ.* 73.
3. What is the cube root of 5735339? *Anſ.* 179.
4. What is the cube root of 32461759? *Anſ.* 319.
5. What is the cube root of 84604519? *Anſ.* 439.
6. What is the cube root of 259694072? *Anſ.* 638.
7. What is the cube root of 48228544? *Anſ.* 364.

☞ *When the quotient is* 2 *or* 3, *there muſt be a cypher put to ſupply the place of tens.*

8. What

8. What is the cube root of 27054036008? *Anſ.* 3002.
9. What is the cube root of 22069810125? *Anſ.* 2805.
10. What is the cube root of 122615327232? *Anſ.* 4968.
11. What is the cube root of 219365327791? *Anſ.* 6031.
12. What is the cube root of 673373097125? *Anſ.* 8765.

1. *When the given number conſiſts of a whole number and decimal together, make the number of decimals conſiſt of* 3, 6, 9, *&c. places by adding cyphers thereto, ſo that there may be a point fall on the unit's place of the multiplier.*

13. What is the cube root of 12,977875? *Anſ.* 2,35.
14. What is the cube root of 36155,027576? *Anſ.* 33,06+
15. What is the cube root of ,0019066624? *Anſ.* ,124.
16. What is the cube root of 33,230979637? *Anſ.* 3,215+
17. What is the cube root of 1926,972504? *Anſ.* 25,16+
18. What is the cube root of ,053258279? *Anſ.* ,376.

To extract the cube root of a vulgar fraction.

RULE. Reduce the fraction to its loweſt terms, then extract the cube root of the numerator and denominator; for a new numerator and denominator; but if the fraction be a ſurd, reduce it to a decimal, and then extract the root from it.

EXAMPLES.

19. What is the cube root of $\frac{250}{686}$? *Anſ.* $\frac{5}{7}$.
20. What is the cube root of $\frac{324}{1500}$? *Anſ.* $\frac{3}{5}$,
21. What is the cube root of $\frac{1520}{5130}$? *Anſ.* $\frac{2}{3}$.

SURDS.

22. What is the cube root of $\frac{4}{7}$? *Anſ.* ,829+
23. What is the cube root of $\frac{5}{9}$? *Anſ.* ,822+
24. What is the cube root of $\frac{2}{3}$? *Anſ.* ,873+

To extract the cube root of a mixed number.

RULE. Reduce the fractional part to its loweſt terms, and then the mixed number to an improper fraction, extract the cube roots of the numerator and denominator for a new numerator and denominator; but, if the mixed number given be a ſurd, reduce the fractional part to a decimal, annex it to the whole number, and extract the root therefrom.

EXAMPLES.

EXAMPLES.

25. What is the cube root of $12\frac{19}{27}$? *Anſ.* $2\frac{1}{3}$.
26. What is the cube root of $31\frac{15}{343}$? *Anſ.* $3\frac{1}{7}$.
27. What is the cube root of $405\frac{28}{125}$? *Anſ.* $7\frac{2}{5}$.

SURDS.

28. What is the cube root of $7\frac{1}{3}$? *Anſ.* 1,93 +
29. What is the cube root of $9\frac{1}{6}$? *Anſ.* 2,092 +
30. What is the cube root of $8\frac{5}{7}$? *Anſ.* 2,057 +

The APPLICATION.

1. If a cubical piece of timber be 47 inches long, 47 inches broad, and 47 inches deep, how many cubical inches doth it contain? *Anſ.* 103823.

2. There is a cellar dug, that is 12 feet every way, in length, breadth, and depth, how many ſolid feet of earth was taken out of it? *Anſ.* 1728.

3. There is a ſtone of a cubic form, which contains 389017 ſolid feet, what is the ſuperficial content of one of its ſides? *Anſ.* 5329.

Between two numbers given, to find two mean proportionals.

RULE. Divide the greater extreme by the leſs, and the cube root of the quotient multiplied by the leſs extreme gives the leſs mean; multiply the ſaid cube root by the leſs mean, and the product will be the greater mean proportional.

EXAMPLES.

4. What are the two mean proportionals between 6 and 162? *Anſ.* 18 *and* 54.

5. What are the two mean proportionals between 4 and 108? *Anſ.* 12 *and* 36.

To find the ſide of a cube that ſhall be equal in ſolidity to any given ſolid, as a globe, cylinder, priſm, cone, &c.

RULE. The cube root of the ſolid content of any ſolid body given, is the ſide of the cube of equal ſolidity.

EXAMPLES.

6. If the ſolid content of a globe is 10648, what is the ſide of a cube of equal ſolidity? *Anſ.* 22.

The

The ſide of the cube being given, to find the ſide of the cube that ſhall be double, treble, &c. in quantity to the cube given.

RULE. Cube the ſide given, and multiply it by 2, 3, &c. the cube root of the product is the ſide ſought.

EXAMPLE.

7. There is a cubical veſſel, whoſe ſide is 12 inches, and it is required to find the ſide of another veſſel, that is to contain 3 times as much? *Anſ.* 17,306.

EXTRACTING *of the* BIQUADRATE ROOT.

TO extract the Biquadrate Root is to find out a number which being involved four times into itſelf will produce the given number.

RULE. Firſt extract the ſquare root of the given number, and then extract the ſquare root of that ſquare root, and it will give the biquadrate root required.

EXAMPLES.

1. What is the biquadrate of 27? *Anſ.* 531441.
2. What is the biquadrate of 76? *Anſ.* 33362176.
3. What is the biquadrate of 275? *Anſ.* 5719140625.
4. What is the biquadrate root of 531441? *Anſ.* 27.
5. What is the biquadrate root of 33362176? *Anſ.* 76.
6. What is the biquadrate root of 5719140625? *Anſ.* 275.

A general RULE *for* EXTRACTING *the* ROOTS *of all* POWERS.

1. PREPARE the number given for extraction, by pointing off from the unit's place as the root required directs.

2. Find the firſt figure in the root by the table of powers, which ſubtract from the given number.

3. Bring down the firſt figure in the next point to the remainder, and call it the Dividend.

4. Involve the root into the next inferior power to that which is given, multiply it by the given power, and call it the Diviſor.

5. Find

5. Find a quotient figure by common division, and annex it to the root; then involve the whole root into the given power, and call that the Subtrahend.

6. Subtract that number from as many points of the given power as are brought down, beginning at the lowest place, and to the remainder bring down the first figure of the next point for a new dividend.

7. Find a new divisor, and proceed in all respects as before.

EXAMPLES.

1. What is the square root of 141376?

```
  . . .
  141376(376
  9
  —
6) 51 dividend.
  ———
  1369 subtrahend.
  ————
74)  447 dividend.
  ————
  141376 subtrahend.
  ————
```

3 × 2 = 6 *divisor.*
37 × 37 = 1369 *subtrahend.*
37 × 2 = 74 *divisor.*
376 × 376 = 141376 *subtrahend.*

2. What is the cube root of 53157376?

```
        53157376(276
        27
        ——
    27)261 dividend.
        ———
        50653 subtrahend.
        ————
  4107)25043  dividend.
        ————————
        53157376 subtrahend.
        ————————
```

3 × 3 × 3 = 27 *divisor.*
37 × 37 × 37 = 50653 *subtrahend.*
37 × 37 × 3 = 4107 *divisor.*
376 × 376 × 376 = 53157376 *subtrahend.*

3. What

What is the biquadrate root of 19987173376?

```
      19987173376(376
      81
     ----
  108)1188 dividend.
     ------
      1874161 subtrahend.
     ------
202612)1245563 dividend.
      ---------
      19987173376 subtrahend.
      ---------
```

3 × 3 × 3 × 4 = 108 *divisor.*
37 × 37 × 37 × 37 = 1874161 *subtrahend.*
37 × 37 × 37 × 4 = 202612 *divisor.*
376 × 376 × 376 × 376 = 19987173376 *subtrahend.*

SIMPLE INTEREST.

THERE are Five Letters to be observed in Simple Interest, *viz.*

P. the Principal.
T. the Time.
R. the Ratio, or Rate *per Cent.*
I. the Interest.
A. the Amount.

A TABLE OF RATIOS.

3	,03	5½	,055	8	,08
3½	,035	6	,06	8½	,085
4	,04	6½	,065	9	,09
4½	,045	7	,07	9½	.095
5	,05	7½	,075	10	,1

NOTE. *The* Ratio *is the Simple Interest of* £1. *for one year, at the* Rate per Cent. *proposed, and is found thus:*

£. £. £.
As 100 : 3 : : 1 : ,03. *As* 100 : 3,5 : : 1 : ,035.

When the principal, time, and rate per cent. *are given to find the intereſt.*

RULE. Multiply the principal, time and rate together, and it will give the intereſt required.

NOTE. *The propoſition and rule are better expreſſed thus:*

1. *When* P, T, R, *are given to find* I.

RULE. *prt*=I.

NOTE. *When two or more letters are put together like a word, they are to be multiplied one into another.*

EXAMPLES.

1. What is the intereſt of £945..10..–, for three years, at 5 *per cent. per annum?*

Anſ. £945,5×,05×3=141,825 *or* £141..16..6.

2. What is the intereſt of £547..14..–, at 4 *per cent. per annum*, for 6 years? *Anſ.* £131..8. 11. 2 *qr.* ,08.

3. What is the intereſt of £796..15. –, at 4½ *per cent. per annum*, for 5 years? *Anſ.* £179..5..4. 2 *qr.*

4. What is the intereſt of £397..9..5, for 2 years and ½, at 3½ *per cent. per annum?* *Anſ.* £34..15..6. 3,5472 *qr.*

5. What is the intereſt of £554..17..6, for 3 years, 8 months, at 4½ *per cent. per annum?* *Anſ.* £91..11..0. 201969.

6. What is the intereſt of £236..18..8, for 3 years, 8 months, at 5½ *per cent. per annum?* *Anſ.* £47..15..7. 1,4528*qr.*

When the intereſt is for any number of days only.

RULE. Multiply the intereſt of £1 for 1 day, at the given rate, by the principal and number of days, it will give the anſwer.

INTEREST OF £1 FOR ONE DAY.

per cent.	*Decimals.*	*per cent.*	*Decimals.*
3	,00008219178	6½	,00017808219
3½	,00009589041	7	,00019178082
4	,00010958904	7½	,00020547945
4½	,00012328767	8	,00021917808
5	,00013698630	8½	,00023287671
5½	,00015068493	9	,00024657534
6	,00016438356	9½	,00026027397

NOTE. *The above Table is thus found:*

As 365 : ,01 : : 1 : ,00008219178. *And as* 365 : : ,035 : 1 : ,00009589041, *&c.*

EXAMPLES.

7. What is the intereſt of £240 for 120 days, at 4 per cent. per annum? *Anſ.* ,00010958904 × 240 × 120 = £3..3..1¼.

8. What is the intereſt of £563, at 6 per cent. per annum, for 126 days? *Anſ.* £11..13..2½.

9. What is the intereſt of £560 for 60 days, at 5 per cent. per annum? *Anſ.* £4..12..–½.

10. What is the intereſt of £364..18..– for 154 days, at 5 per cent. per annum? *Anſ.* £7..13..11¼.

11. What is the intereſt of £725..15..– for 74 days, at 4 per cent. per annum? *Anſ.* £5..17..8¼.

12. What is the intereſt of £100 from the 1ſt of June, 1775, to the 9th of March following, at 5 per cent. per annum? *Anſ.* £3..16..11¾.

II. *When* P, R, T, *are given to find* A.

RULE. $prt+p=A$.

EXAMPLES.

13. What will £279..12..– amount to in 7 years, at 4 ½ per cent. per annum? *Anſ.* £367..13..5. 3,04 *qrs.*

279,6 × ,045 × 7 + 279,6 = 367,674.

14. What will £320..17..– amount to in 5 years, at 3 ½ per cent. per annum? *Anſ.* £376..19..11. 2,8 *qrs.*

15. What will £679..13..– amount to in 6 years, at 5 per cent. per annum? *Anſ.* £883..10..10. 3,2 *qrs.*

When there is any odd time given with the whole years, reduce the odd time into days, and work with the decimal parts of a year which are equal to thoſe days.

16. What will £926..12..– amount to in 5 years ½, at 4 per cent. per annum? *Anſ.* £1130..9..–. 1,92 *qrs.*

17. What will £368..16..– amount to in 7 years ¾, at 6 ½ per cent. per annum? *Anſ.* £554..11..7. 3,68 *qrs.*

18. What will £273..18..– amount to in 4 years, 175 days, at 3 per cent. per annum?

Anſ. £310..14..1. 3,3508006 4 *qrs.*

III. *When* A, R, T, *are given to find* P.

RULE. $\frac{a}{rt+1}=P$.

EXAMPLES.

19. What principal, being put to intereſt, will amount to £367..13..5. 3,04*qrs.* in 7 years, at 4 ½ per cent. per annum? *Anſ.* ,045×7+1=1,315, *then* 367,674÷1,315 =£279..12..–.

20. What principal, being put to intereſt, will amount to £376..19..11. 2,8, in 5 years, at 3 ½ per cent. per annum? *Anſ.* £320..17..–.

21. What principal, being put to intereſt, will amount to £883..10..10. 3,2 *qrs.* in 6 years, at 5 per cent. per annum? *Anſ.* £679..13..–.

22. What principal, being put to intereſt, will amount to £1130..9..–. 1,92 *qrs.* in 5 years ½, at 4 per cent. per annum? *Anſ.* £926..12..–.

23. What principal will amount to £554..11..7. 3,68*qrs.* in 7 years ¾, at 6½ per cent. per annum? *Anſ.* £368..16..–.

24. What principal will amount to £310..14..1. 3,35080064 *qrs.* in 4 years, 175 days, at 3 per cent. per annum? *Anſ.* £273..18..–.

IV. *When* A, P, T, *are given to find* R.

RULE. $\frac{a-p}{pt.}=R.$

EXAMPLES.

25. At what rate per cent. will £279..12..–. amount to £367..13..5. 3,04 *qrs.* in 7 years?

Anſ. 367,674—279,6=88,074. 279,6×7=1957,2 *then* 88,074÷1957,2=,045 *or* 4½ *per cent.*

26. At what rate per cent. will £320..17..–. amount to £376..19..11. 2,8 *qrs.* in 5 years? *Anſ.* 3½ *per cent.*

27. At what rate per cent. will £679..13..–. amount to £883..10..10. 3,2 *qrs.* in 6 years? *Anſ.* 5 *per cent.*

28. At what rate per cent. will £926..12..–. amount to £1130..9..– 1,92 *qrs.* in 5 years ½? *Anſ.* 4 *per cent.*

29. At what rate per cent. will £368..16..–. amount to £554..11..7. 3,68 *qrs.* in 7 years ¾? *Anſ.* 6½ *per cent.*

30. At what rate per cent. will £273..18..–. amount to £310..14..1. 3,35080064 *qrs.* in 4 years, 175 days?

Anſ. 3 *per cent.*

V. *When* A, P, R, *are given to find* T.

RULE. $\frac{a-p}{pr.}=T.$

EXAMPLES.

EXAMPLES.

31. In what time will £279..12..– amount to £367..13..5.. 3,04*qrs.* at 4 ½ per cent.? *Anſ.* 367,674—279,6=88,074. 279,6×,045=12,5820 *then* 88,074÷12,5820=7 *years.*

32. In what time will £320..17..–amount to £376..19..11.. 1,8 *qrs.* at 3 ½ per cent.? *Anſ.* 5 *years.*

33. In what time will £679..13..–amount to £883..10..10.. 3,2*qrs.* at 5 per cent.? *Anſ.* 6 *years.*

34 In what time will £926..12..–amount to £1130..9..–. 1,92*qrs.* at 4 per cent.? *Anſ.* 5 *years* ½.

35. In what time will 368..16..–amount to £554..11..7.. 3,68*qrs.* at 6 ½ per cent.? *Anſ.* 7 *years* ¾.

36. In what time will £273..18..–amount to £310..14..1.. 3,3508006 4*qrs.* at 3 per cent.? *Anſ.* 4 *years*, 175 *days.*

Annuities *or* Penſions, *&c.* in Arrears.

Annuities or Penſions, *&c.* are ſaid to be in Arrears, when they are payable or due, either yearly, half-yearly, or quarterly, and are unpaid for any number of payments.

NOTE. U *repreſents the* annuity, penſion, *or* yearly rent.. T, R, A, *as before.*

I. *When* U, R, T, *are given to find* A.

RULE. $\frac{ttu-tu}{2} \times r : + tu = A.$

EXAMPLES.

37. If a ſalary of £150 be forborne 5 years, at 5 per cent. what would it amount to? *Anſ.* £825.

$5\times5\times150-5\times150=3000$ *then* $\frac{3000}{2}\times,05+5\times150=£825.$

38. If £250 yearly penſion be forborne 7 years, what will it amount to in that time, at 6 per cent.? *Anſ.* £2065.

39. There is a houſe let upon a leaſe for 5 years ½, at £60 per annum, what will be the amount of the whole time, at 4 ½ per cent.? *Anſ.* £363..8..3.

40. Suppoſe an annual penſion of £28 remain unpaid for 8 years, what would it amount to at 5 per cent.? *Anſ.* £263..4..–.

NOTE. *When the annuities*, &c. *are to be paid half-yearly, or quarterly, then*

For half-yearly payments, *take half of the ratio, half of the annuity*, &c. *and twice the number of years*,—*and*,

For quarterly payments, *take a fourth part of the ratio, a fourth part of the annuity*, &c. *and four times the number of years, and work as before.*

EXAMPLES.

41. If a ſalary of £150, payable every half year, remains unpaid for 5 years, what would it amount to in that time, at 5 per cent.? *Anſ.* £834..7..6.

42. If a ſalary of £150, payable every quarter, was left unpaid for 5 years, what would it amount to in that time, at 5 per cent.? *Anſ.* £839..1..3.

NOTE. *It may be obſerved, by comparing theſe laſt examples, the amount of the half-yearly payments are more advantageous than the yearly, and the quarterly more than the half-yearly.*

II. *When* A, R, T, *are given to find* U.

RULE. $\frac{2a}{ttr-tr+2t} = U.$

EXAMPLES.

43 If a ſalary amounted to £825 in 5 years, at 5 per cent. what was the ſalary? *Anſ.* £150.

$825\times 2=1650.5\times 5\times,05-5\times,05+5\times 2=11$ *then* $1650\div 11=$£150.

44. If a houſe is to be let upon a leaſe for 5 years $\frac{1}{2}$, and the amount for that time be £363..8..3, at $4\frac{1}{2}$ per cent. what is the yearly rent? *Anſ.* £60.

45. If a penſion amounted to £2065 in 7 years, at 6 per cent. what was the penſion? *Anſ.* £250.

46. Suppoſe the amount of a penſion be £263..4..— in 8 years, at 5 per cent. what is the penſion? *Anſ.* £28.

NOTE. *When the payments are half-yearly, then take* 4 a *and half of the ratio, and twice the number of years: and if quarterly, then take* 8 a, *one fourth of the ratio, and four times the number of years, and proceed as before.*

47. If the amount of a ſalary, payable half-yearly, for 5 years, and at 5 per cent. be £834..7..6, what is the ſalary? *Anſ.* £150.

48. If

48. If the amount of an annuity, payable quarterly, be £839..1..3 for 5 years, at 5 per cent. what is the annuity?
Anſ. £150.

III. *When* U, A, T, *are given to find* R.

RULE. $\frac{2a-2ut}{utt-ut}=R.$

EXAMPLES.

49. If a ſalary of £150 per annum amount to £825 in 5 years, what is the rate per cent.? *Anſ.* 5 *per cent.*

$825\times2-150\times5\times2=150$ *then* $\frac{150}{150\times5\times5-150\times5}=,05$

50. If an houſe be let upon leaſe for 5 years $\frac{1}{2}$, at £60 per annum, and the amount for that time be £363..8..3, what is the rate per cent.? *Anſ.* 4 $\frac{1}{2}$ *per cent.*

51. If a penſion of £250 per annum amounts to £2065 in 7 years, what is the rate per cent.? *Anſ.* 6 *per cent.*

52. Suppoſe the amount of a yearly penſion of £28 be £263..4..– in 8 years, what is the rate per cent.?
Anſ. 5 *per cent.*

NOTE. *When the payments are half-yearly, take* 4 a—4 ut *for a dividend, and work with half the annuity, and double the number of years for a diviſor; if quarterly, take* 8 a—8 ut, *and work with a fourth of the annuity, and four times the number of years.*

53. If a ſalary of £150 per annum, payable half-yearly, amounts to £834..7..6 in 5 years, what is the rate per cent.? *Anſ.* 5 *per cent.*

54. If an annuity of 150 per annum, payable quarterly, amounts to £839..1..3 in 5 years, what is the rate per cent.? *Anſ.* 5 *per cent.*

IV. *When* U, A, R, *are given to find* T.

RULE. *Firſt,* $\frac{2}{r}-1=x$ *then* $\sqrt{\frac{2a}{ur}+\frac{xx}{4}}-\frac{x}{2}=T.$

EXAMPLES.

55. In what time will a ſalary of £150 per annum amount to £825, at 5 per cent.? *Anſ.* 5 *years.*

$$\frac{2}{,05} - 1 = 39 \frac{825 \times 2}{150 \times ,05} = 220 \frac{39 \times 39}{4} = 380,25$$

$$\sqrt{220 + 380,25} = 24.5 - \frac{39}{2} = 5 \text{ years.}$$

56. If an houſe is let upon leaſe for a certain time for £60 per annum, and the amount be £363..8..3. at 4 ½ per cent. what time was it let for? *Anſ.* 5 ½ *years.*

57. If a penſion of £250 per annum, being forborne a certain time, amounts to £2065, at 6 per cent. what was the time of forbearance? *Anſ.* 7 *years.*

58. In what time will a yearly penſion of £28 amount to £263..4..–, at 5 per cent.? *Anſ.* 8 *years.*

Note. *If the payments are half-yearly, take half the ratio and half the annuity; if quarterly, one fourth of the ratio, and one fourth of the annuity; and* T *will be equal to thoſe half-yearly or quarterly payments.*

59. If an annuity of £150 per annum, payable half-yearly, amounts to £834..7..6, at 5 per cent. what time was the payment forborne? *Anſ.* 5 *years.*

60. If a yearly penſion of £150, payable quarterly, amounts to £839..1..3, at 5 per cent. what was the time of forbearance? *Anſ.* 5 *years.*

Preſent Worth of ANNUITIES.

Note. P *repreſents the preſent worth*; U, T, R, *as before.*

I. *When* U, T, R, *are given to find* P.

RULE. $\frac{ttr - tr + 2t}{2tr + 2} : \times u = P.$

EXAMPLES.

61. What is the preſent worth of £150 per annum, to continue 5 years, at 5 per cent.? *Anſ.* £660.

$5 \times 5 \times ,05 - 5 \times ,05 + 5 \times 2 = 11.$ $5 \times ,05 \times 2 + 2 = 2,5$

then $11 \div 2,5 \times 150 =$ £660.

62. What is the yearly rent of a houſe of £60, to continue 5 ½ years, worth in ready money, at 4 ½ per cent.?
Anſ. £291..6..3.

63. What is the preſent worth of £250 per annum, to continue 7 years, at 6 per cent.? *Anſ.* £1454..4..6.

64. What is a penſion of £28 per annum worth in ready money, at 5 per cent. for 8 years? *Anſ.* £188.

Note. *The ſame thing is to be obſerved in the firſt rule of annuities in arrears, concerning half-yearly and quarterly payments.*

65. What is the preſent worth of £150 payable half-yearly, for 5 years, at 5 per cent.? *Anſ.* £667..10..–.

66. What is the preſent worth of £150, payable quarterly, for 5 years, at 5 per cent.? *Anſ.* £671..5..–.

Note. *By comparing the laſt examples it will be found that the preſent worth of half-yearly payments is more advantageous than yearly; and quarterly, than half-yearly.*

II. *When* P, T, R, *are given to find* U.

RULE. $\frac{tr+1}{ttr.-tr+2t} : \times 2p = U.$

EXAMPLES.

67. If the preſent worth of a ſalary be £660, to continue 5 years, at 5 per cent. what was the ſalary? *Anſ.* £150.

$5\times,05+1=1,25.$ $5\times5\times,05-5\times,05+10=11.$

then $\frac{1,25}{11}\times660\times2=150$

68. There is an houſe let upon leaſe for 5 ½ years to come, I deſire to know the yearly rent, when the preſent worth, at 4 ½ per cent. is £291..6..3? *Anſ.* £60.

69. What annuity is that which for 7 years continuance, at 6 per cent. produces £1454..4..6. preſent worth?

Anſ. £250.

70. What annuity is that which for 8 years continuance produces £188 for the preſent worth, at 5 per cent.?

Anſ. £28.

Note. *When the payments are half-yearly, take half the ratio, twice the number of years, and multiply by* 4 p; *and when quarterly take one fourth of the ratio, four times the number of years, and multiply by* 8 p.

71. There is an annuity, payable, half-yearly, for 5 years to come, what is the yearly rent, when the preſent worth, at 5 per cent. is £667..10..–? *Anſ.* £150.

72. There is an annuity, payable quarterly, for 5 years to come, I deſire to know the yearly income, when the preſent worth, at 5 per cent. is £671..5..–? *Anſ.* £150.

III. *When* U, P, T, *are given to find* R.

RULE. $\frac{ut-p\times2}{2pt+ut-utt}=R.$

EXAMPLES.

EXAMPLES.

73. At what rate per cent. will an annuity of £150 per annum, to continue 5 years, produce the preſent worth of £660? *Anſ.* 5 *per cent.*

$150\times5-660\times2=1800.2\times66\times5+150\times5-150\times5\times5$
$=3600$ *then* $180\div3600=,05=5$ *per cent.*

74. If a yearly rent of £60 per annum, to continue $5\frac{1}{2}$ years produce £291..6..3 for the preſent worth, what is the rate per cent.? *Anſ.* $4\frac{1}{2}$ *per cent.*

75. If an annuity of £250 per annum, to continue 7 years, produce £1454..4..6 for the preſent worth, what is the rate per cent.? *Anſ.* 6 *per cent.*

76. If a penſion of £28 per annum, to continue 8 years, produces £188 for the preſent worth, what is the rate per cent.? *Anſ.* 5 *per cent.*

Note. *When the annuities, or rents,* &c. *are to be paid half-yearly, or quarterly, then*

For half-yearly payments, *take half of the annuity,* &c. *and twice the number of years, the quotient will be the ratio of half the rate* per cent.—*and,*

For quarterly payments, *take a fourth part of the annuity,* &c. *and four times the number of years, the quotient will be the ratio of a fourth part of the rate* per cent.

77. An annuity of £150 per annum, payable half-yearly, having 5 years to come, is ſold for £667..10..–, what is the rate per cent.? *Anſ.* £5 *per cent.*

78. If an annuity of £150 per annum, payable quarterly, having 5 years to come, is ſold for £671..5..–, what is the rate per cent.? *Anſ.* £5 *per cent.*

IV. *When* U, P, R, *are given to find* T.

RULE. $\frac{2}{r}-\frac{2p}{u}-1=x$ *then* $\sqrt{\frac{2p}{ur}+\frac{xx}{4}}-\frac{x}{2}=T.$

EXAMPLES.

79. If an annuity of £150 per annum produce £660 for the preſent worth, at 5 per cent. what is the time of its continuance? *Anſ.* 5 *years.*

$$\frac{2}{,05} - \frac{660 \times 2}{150} - 1 = 30,2 \qquad \frac{660 \times 2}{150 \times ,05} = 176$$

$$\frac{30,2 \times 30,2}{4} = 228,01 \text{ then } \surd 228,01 + 176 = 20,1$$

$$20,1 - \frac{30,2}{2} = 5 \text{ years.}$$

80. For what time may a ſalary of £60 be purchaſed for £291..6..3, at 4½ per cent.? *Anſ.* 5½ *years.*

81. For how long time may £250 per annum be purchaſed for £1454..4..6. at 6 per cent.? *Anſ.* 7 *years.*

82. What time may a penſion of £28 per annum be bought for £188 at 5 per cent.? *Anſ.* 8 *years.*

NOTE. *When the payments are half-yearly, then* U *will be equal to the half annuity, &c.* R, *half the ratio, and* T *the number of payments; and*

When the payments are quarterly, U *will be equal to a fourth part of the annuity, &c.* R, *the fourth of the ratio, and* T *the number of payments.*

83. If an annuity of £150 per annum, payable half-yearly, is ſold for £667..10..–, at 5 per cent. I deſire to know the number of payments, and the time to come?

Anſ. 10 *payments,* 5 *years.*

84. An annuity of £150 per annum, payable quarterly, is ſold for £671..5..– at 5 per cent. what is the number of payments and time to come? *Anſ.* 20 *payments,* 5 *years.*

ANNUITIES, *&c. taken in* REVERSION.

1. *To find the preſent worth of an annuity, &c. taken in reverſion.*

RULE. Find the preſent worth of the yearly ſum at the given rate, and for the time of its continuance, *thus,*

$$\frac{ttr - tr + 2t}{2tr + 2} \times u = P.$$

2. Change P. into A. and find what principal being put to intereſt will amount to A. at the ſame rate, and for the time to come before the annuity, *&c.* commences, *thus,*

$$\frac{a}{tr + 1} = P.$$

EXAMPLES.

EXAMPLES.

85. What is the preſent worth of an annuity of £150 per annum, to continue 5 years, but not to commence till the end of 4 years, allowing 5 per cent. to the purchaſer?

Anſ. £550.

$$\frac{5\times5\times,05-5\times,05+2\times5=4,4\times150=}{5\times05\times2+2}\quad\frac{660}{4\times,05+1}=550$$

86. What is the preſent worth of a leaſe of £50 per annum, to continue 4 years, but is not to commence till the end of 5 years, allowing 4 per cent. to the purchaſer?

Anſ. £152 .. 5 .. 11. 3 *qrs.*

87. A perſon having the promiſe of a penſion of £20 per annum, for 8 years, but not to commence till the end of 4 years, is willing to diſpoſe of the ſame, at 5 per cent. what will be the preſent worth? *Anſ.* £111 .. 18 .. 1. 14+.

88. A legacy of £40 being left for 6 years to a perſon of 15 years of age, but is not to commence till he is 21; he wanting money, is deſirous of ſelling the ſame at 4 per cent. what is the preſent worth? *Anſ.* £171 .. 14 .. -.

2. *To find the yearly income of an annuity*, &c. *in reverſion.*

RULE. 1. Find the amount of the preſent worth at the given rate, and for the time before the reverſion, *thus*, $ptr+p=A.$

2. Change A. into P. and find what annuity being ſold will produce P at the ſame rate, and for the time of its continuance, *thus*, $\frac{tr+1}{ttr-tr+2t}:\times 2p=U.$

EXAMPLES.

89. A perſon having an annuity left him for 5 years, which does not commence till the end of 4 years, diſpoſed of it for £550, allowing 5 per cent. to the purchaſer, what was the yearly income? *Anſ.* £150.

$$550\times4\times,05+550=660 \qquad \frac{5\times,05+1,}{5\times5\times,05-5\times,05+5\times2}$$

$=,113630\times660\times2=$£150.

90. There

90. There is a leaſe of an houſe taken for 4 years, but not to commence till the end of 5 years, the leſſee would ſell the ſame for £152..6..– preſent payment, allowing 4 per cent. to the purchaſer, what is the yearly rent?

Anſ. £50.

91. A perſon having the promiſe of a penſion for 8 years, which does not commence till the end of 4 years, has diſpoſed of the ſame for £111..18..1,14 preſent money, allowing 5 per cent. to the purchaſer, what was the penſion? *Anſ.* £20.

92. There is a certain legacy left to a perſon of 15 years of age, which is to be continued for 6 years, but not to commence till he arrives to the age of 21; he wanting a ſum of money, ſells it for £171..14..–, allowing 4 per cent. to the buyer, what was the annuity left him? *Anſ.* £40.

REBATE *or* DISCOUNT.

NOTE. S repreſents the Sum to be diſcounted.
P the Preſent Worth.
T the Time.
R the Ratio.

I. *When* S, T, R, *are given to find* P.

RULE. $\frac{s}{tr+1}=P.$

EXAMPLES.

1. What is the preſent worth of £357..10..–, to be paid 9 months hence, at 5 per cent.? *Anſ.* £344..11..6. 3,168*qrs.*

$$\frac{357,5}{,75\times,05+1}=344,5783$$

2. What is the preſent worth of £275..10..–, due 7 months hence, at 5 per cent.? *Anſ.* £267..13..10. ,164*d.*

3. What is the preſent worth of £875..5..6, due 5 months hence, at $4\frac{1}{2}$ per cent.? *Anſ.* £859..3..3. 3,2544*qrs.*+

4. How much ready money can I receive for a note of £75, due 15 months hence, at 5 per cent.?

Anſ. £70..11..9.,1752*d.*

II. *When* P, T, R, *are given to find* S.

RULE. $ptr+p=S$.

EXAMPLES.

5. If the preſent worth of a ſum of money due 9 months hence, allowing 5 per cent. be £344..11..6. 3,168 *qrs.* what was the ſum firſt due? *Anſ.* £357..10..–.

$344,5783\times,75\times,05+344,5783=$£357..10..–.

6. A perſon owing a certain ſum, payable 7 months hence, agrees with the creditor to pay him down £267..13..10. ,164*d.* allowing 5 per cent. for preſent payment, what is the debt? *Anſ.* £275..10..–.

7. A perſon receives £859..3..3. 3,2544 *qrs.* for a ſum of money due 5 months hence, allowing the debtor 4 ½ per cent. for preſent payment, what was the ſum due?

Anſ. £875..5..6.

8. A perſon paid £70..11..9. ,1752 for a debt due 15 months hence, he being allowed 5 per cent. for the diſcount, how much was the debt? *Anſ.* 75.

III. S, P, T, *are given to find* R.

RULE. $\frac{s-p}{tp}=R$.

EXAMPLES.

9. At what rate per cent. will £357..10..–, payable 9 months hence, produce £344..11..6. 3,168 *qrs.* for preſent payment? *Anſ.* 5 *per cent.*

$$\frac{357,5-344,5783}{344,5783\times,75}=,05=5 \text{ per cent.}$$

10. At what rate per cent. will £275..10..–, payable 7 months hence, produce £267..13..10. ,164*d.* for preſent payment? *Anſ.* 5 *per cent.*

11. At what rate per cent. will £875..5..6, payable 5 months hence, produce the preſent payment of £859..3..3. 3,2544 *qrs.*? *Anſ.* 4 ½ *per cent.*

12. At what rate per cent. will £75, payable 15 months hence, produce the preſent payment of £70..11..9. ,1752? *Anſ.* 5 *per cent.*

IV. *When*

IV. *When* S, P, R, *are given to find* T.

RULE. $\frac{s-p}{rp} = T.$

EXAMPLES.

13. The preſent worth of £357..10..–, due for a certain time to come, is £344..11..6. 3,168 *qrs.* at 5 per cent. in what time ſhould the ſum have been paid without any rebate? *Anſ.* 9 *months.*

$$\frac{357{,}5-344{,}57783}{344{,}57783\times{,}05} = {,}75 = 9 \text{ months.}$$

14. The preſent worth of £275..10..–, due for a certain time to come, is £267..13..10. ,164*d.* at 5 *per cent.* in what time ſhould the ſum have been paid without any rebate?
Anſ. 7 *months.*

15. A perſon receives £859..3..3. 3,254 *qrs.* for £875..5..6, due at a certain time to come, allowing $4\frac{1}{2}$ per cent. diſcount; I deſire to know in what time the debt ſhould have been diſcharged without any rebate?
Anſ. 5 *months.*

16. I have received £70..11..9. ,1752*d.* for a debt of £75, allowing the perſon 5 per cent. for prompt payment; I deſire to know when the debt would have been payable without the rebate? *Anſ.* 15 *months.*

EQUATION *of* PAYMENTS.

To find the equated time for the payment of a ſum of money due at ſeveral times.

RULE. Find the preſent worth of each payment for its reſpective time, thus $\frac{s}{tr+1} = P.$

Add all the preſent worths together, *then* $s-p = D.$

and $\frac{d}{pr} = E.$

EXAMPLES.

1. D owes E £200, whereof £40 is to be paid at 3 months, £60 at 6 months, and £100 at 9 months; at what time may the whole debt be paid together, rebate being made at 5 per cent.? *Anſ.* 6 *months*, 26 *days.*

$\frac{40}{1,0125}=39,5061 \quad \frac{60}{1,025}=58,5365 \quad \frac{100}{1,0375}=96,3855$

then 200—39,5061+58,5365+96,3855=5,5719

$\frac{5,5719}{194,4281\times,05}=,57315=6$ *months*, 26 *days.*

2. D owes F £800, whereof £200 is to be paid in 3 months, £200 at 4 months, and £400 at 6 months; but they agreeing to make but one payment of the whole, at the rate of 5 per cent. rebate, the true equated time is demanded? *Anſ.* 4 *months*, 22 *days.*

3. E owes F £1200, which is to be paid as follows; £200 down, £500 at the end of 10 months, and the reſt at the end of 20 months; but they agreeing to have one payment of the whole, rebate at 3 per cent. the true equated time is demanded? *Anſ.* 1 *year*, 11 *days.*

COMPOUND INTEREST.

THE letters made uſe of in Compound Intereſt are,

A the Amount.
P the Principal.
T the Time.
R the Amount of £1 for 1 year, at any given rate; which is thus found:

As 100 : 105 : : 1 : 1,05. As 100 : 105,5 : : 1 : 1,055.

A TABLE of the Amount of £1 for One Year.

Rates per cent.	*Amts. of £1.*	*Rates per cent.*	*Amts. of £1.*	*Rates per cent.*	*Amts. of £1.*
3	1,03	5½	1,055	8	1,08
3½	1,035	6	1,06	8½	1,085
4	1,04	6½	1,065	9	1,09
4½	1,045	7	1,07	9½	1,095
5	1,05	7½	1,075	10	1,1

A TABLE ſhewing the amount of £1 for any number of years under 31, at 5 and 6 *per cent. per annum.*

Years.	5 *Rates* 6		*Years*	5 *Rates* 6	
1	1,05000	1,06000	16	2,18287	2,54035
2	1,10250	1,12360	17	2,29201	2,69277
3	1,15762	1,19101	18	2,40662	2,85434
4	1,21550	1,26247	19	2,52695	3,02559
5	1,27628	1,33822	20	2,65329	3,20713
6	1,34009	1,41852	21	2,78596	3,39956
7	1,40710	1,50363	22	2,92526	3,60353
8	1,47745	1,59384	23	3,07152	3,81975
9	1,55132	1,68948	24	3,22510	4,04893
10	1,62889	1,79084	25	3,38635	4,29187
11	1,71034	1,89829	26	3,55567	4,54938
12	1,79585	2,01219	27	3,73345	4,82234
13	1,88565	2,13292	28	3,92013	5,11168
14	1,97993	2,26090	29	4,11613	5,41838
15	2,07892	2,39655	30	4,32194	5,74349

NOTE. *The above table is thus made:* As 100 : 105 : : 1 : 1,05 *for the firſt year; then,* As 100 : 105 : : 1,05 : 1,025, *ſecond year,* &c.

I. *When* P, T, R, *are given to find* A.

RULE. $p \times r^t = A$.

EXAMPLES.

1. What will £225 amount to in 3 years time, at 5 per cent. per annum? *Anſ.* 1,05 × 1,05 × 1,05 = 1,157625 *then* 1,157625 × 225 = £260..9..3. 3*qrs.*

2. What will £200 amount to in 4 years, at 5 per cent. per annum? *Anſ.* £243. 2,025*s.*

3. What will £450 amount to in 5 years, at 4 per cent. per annum? *Anſ.* £547..9..10. 2,0538368 *qrs.*

4. What will £500 amount to in 4 years, at 5 ½ per cent. per annum? *Anſ.* £619..8..2. 3,8323 *qrs.*

II. *When* A, R, T, *are given to find* P.

RULE. $\frac{a}{r^t} = P$.

EXAMPLES.

5. What principal being put to intereſt will amount to £260..9..3. 3*qrs.* in 3 years at 5 per cent. per annum?

$1{,}05 \times 1{,}05 \times 1{,}05 = 1{,}157625$. $\frac{260{,}465625}{1{,}157625} = £225$.

6. What principal being put to intereſt will amount to £243. 2,025*s.* in 4 years at 5 per cent. per annum?

Anſ. £200.

7. What principal will amount to £547 .. 9 .. 10. 2,0538368 *qrs.* in 5 years, at 4 per cent. per annum?

Anſ. £450.

8. What principal will amount to £619..8..2. 3,8323*qrs.* in 4 years, at $5\frac{1}{2}$ per cent.? *Anſ.* £500.

III. *When* P, A, T, *are given to find* R.

RULE, $\sqrt[t]{\frac{a}{p}} = r$ *which being extracted by the rule of extraction, (the time given to the queſtion ſhewing the power) will give* R.

EXAMPLES.

9. At what rate per cent. will £225 amount to £260 .. 9 .. 3. 3 *qrs.* in 3 years? *Anſ.* 5 *per cent.*

$\frac{260{,}465625}{225} = 1{,}157625$ *the cube root of which (it being the 3d. power)* $= 105 = 5$ *per cent.*

10. At what rate per cent. will £200 amount to £243. 2,025*s.* in 4 years? *Anſ.* 5 *per cent.*

11. At what rate per cent. will £450 amount to £547..9..10. 2,0538368 *qrs.* in 5 years? *Anſ.* 4 *per cent.*

12. At what rate per cent. will £500 amount to £619..8..2. 3,8323 *qrs.* in 4 years? *Anſ.* $5\frac{1}{2}$ *per cent.*

IV. *When* P, A, R, *are given to find* T.

RULE. $\log \frac{a}{p} \div \log r$ *which being continually divided by* R, *till nothing remains, the number of thoſe diviſions will be equal to* T.

EXAMPLES.

EXAMPLES.

13. In what time will £225 amount to £260 .9..3. 3*qrs.* at 5 per cent.?

$$\frac{260,465625}{225} = 1,157625 = \frac{1,157625}{1,05} = 1,1025 = \frac{1,1025}{1,05} = 1,05 = \frac{1,05}{1,05}$$

= 1. *The number of divisions being* 3 = *time sought.*

14 In what time will £200 amount to £243. 2,0253. at 5 per cent.? *Anſ.* 4 *years.*

15. In what time will £450 amount to £547 .. 9 .. 10. 2,0538368 *qrs.* at 4 per cent.? *Anſ.* 5 *years.*

16. In what time will £500 amount to £619 .. 8 .. 2. ,38323 *qrs.* at 5 ½ per cent.? *Anſ.* 4 *years.*

ANNUITIES, *or* PENSIONS, *in* ARREARS.

NOTE. U *repreſents the annuity, penſion, or yearly rent*; A,R,T, *as before.*

A TABLE ſhewing the amount of £1 annuity for any number of years under 31, at 5 and 6 *per cent. per ann.*

Yrs.	5 *Rates* 6		*Yrs.*	5 *Rates* 6	
1	1,00000	1,00000	16	23,65749	25,67252
2	2,05000	2,06000	17	25 84036	28,21288
3	3,15250	3,18360	18	28,13238	30,90565
4	4,31012	4,37461	19	30,53900	33,75999
5	5,52563	5,63709	20	33,06595	36,78559
6	6,80191	6,97532	21	35,71925	39,99272
7	8,14200	8,39383	22	38,50521	43,39229
8	9,54910	9,89746	23	41,43047	46,99582
9	11,02656	11,49131	24	44,50199	50,81557
10	12,57789	13,18079	25	47,72709	54,86451
11	14,20678	14,97164	26	51,11345	59,15638
12	15,91712	16,86994	27	54,66912	63,70576
13	17,71298	18,88213	28	58,40258	68,52811
14	19,59863	21,01506	29	62,32271	73,63979
15	21,57856	23,27597	30	66,43884	79,05818

NOTE. *The above table is made thus: take the firſt year's amount, which is* £1, *multiply it by* 1,05 + 1 = 2,05 = *ſecond year's amount, which alſo multiply by* 1,05 + 1 = 3,1525 = *third year's amount.*

I. *When*

I. *When* U, T, R, *are given to find* A.

$$\text{RULE.}\quad \frac{ur^t - u}{r - 1} = A, \text{ or by the table thus,}$$

Multiply the amount of £1 for the number of years, and at the rate per cent. given in the queſtion, by the annuity, penſion, &c. and it will give the anſwer.

EXAMPLES.

17. What will an annuity of £50 per annum, payable yearly, amount to in 4 years, at 5 per cent.?

Anſ. 1,05 × 1,05 × 1,05 × 1,05 × 50 = 60,77531250

$$\text{then}\quad \frac{60{,}7753125 - 50}{1{,}05 - 1} = £215..10..1.\ 2qrs. \quad \text{or,}$$

by the table thus, 4,31012 × 50 = £215..10..1. 1,76 *qrs.*

18. What will a penſion of £45 per annum, payable yearly, amount to in 5 years, at 5 per cent.?

Anſ. £248..13..—. 3,27 *qrs.*

19. If a ſalary of £40 per annum, to be paid yearly, be forborne 6 years, at 6 per cent. what is the amount?

Anſ. 279..—. 3,072*d.*

20. If an annuity of £75 per annum, payable yearly, be omitted to be paid for 10 years, at 6 per cent. what is the amount? *Anſ.* £988..11. 2,22*d.*

II. *When* A, R, T, *are given to find* U.

$$\text{RULE.}\quad \frac{ar - a}{r^t - 1} = U.$$

EXAMPLES.

21. What annuity, being forborne 4 years, will amount to £215..10..1. 2 *qrs.* at 5 per cent.?

$$\text{Anſ.}\quad \frac{215{,}50625 \times 1{,}05 - 215{,}50625}{1{,}05 \times 1{,}05 \times 1{,}05 \times 1{,}05 - 1} = £50.$$

22. What

22. What penſion being forborne 5 years will amount to £248..13..–. 3,27 *qrs.* at 5 per cent.? *Anſ.* £45.

23. What ſalary being omitted to be paid 6 years will amount to £279..–. 3,072*d.* at 6 per cent.? *Anſ.* £40.

24. If the payment of an annuity being forborne 10 years amount to £988..11. 2,22*d.* at 6 per cent. what is the annuity? *Anſ.* £75.

III. *When* U, A, R, *are given to find* T.

RULE. $\frac{ar+u-a}{u}=r^t$ *which being continually divided by* R, *till nothing remains, the number of thoſe diviſions will be equal to* T.

EXAMPLES.

25. In what time will £50 per annum amount to £215..10..1. 2 *qrs.* at 5 per cent. for non-payment?

Anſ. $\frac{215,50625\times 1,05+50-215,50625}{50}=1,21550625.$

which being continually divided by R, *the number of thoſe diviſions will be* = 4 *years.*

26. In what time will £45 per annum amount to £248..13..–. 3,27 *qrs.* allowing 5 per cent. forbearance of payment? *Anſ.* 5 *years.*

27. In what time will £40 per annum amount to £279..–. 3,072, at 6 per cent.? *Anſ.* 6 *years.*

28. In what time will £75 per annum amount to £988..11. 2,22*d.* allowing 6 per cent. for forbearance of payment? *Anſ.* 10 *years.*

PRESENT WORTH OF ANNUITIES, PENSIONS, &c.

A TABLE ſhewing the preſent worth of £1 annuity for any number of years under 31, rebate at 5 and 6 *per cent.*

Yrs.	5 *Rates* 6		*Yrs.*	5 *Rates* 6	
1	0,95238	0,94339	16	10,83777	10,10589
2	1,85941	1,83339	17	11,27406	10,47726
3	2,72324	2,67301	18	11,68958	10,82760
4	3,54595	3,46510	19	12,08532	11,15811
5	4,32947	4,21236	20	12,46221	11,46992
6	5,07569	4,91732	21	12,82115	11,76407
7	5,78637	5,58238	22	13,16300	12,04158
8	6,46321	6,20979	23	13,48857	12,30338
9	7,10782	6,80169	24	13,79864	12,55035
10	7,72173	7,36008	25	14,09394	12,78335
11	8,30641	7,88687	26	14,37518	13,00316
12	8,86325	8,38384	27	14,64303	13,21053
13	9,39357	8,85268	28	14,89812	13,40616
14	9,89864	9,29498	29	15,14107	13,59072
15	10,37965	9,71225	30	15,37245	13,76483

Note. *The above table is thus made: divide* £1 by 1,05 =,95238, *the preſent worth of the firſt year, which* ÷ 1,05 =,90703, *added to the firſt year's preſent worth* = 1,85941, *the ſecond year's preſent worth; then,* 90703÷1,05 *and the quotient added to* 1,85941 = 2,72324, *third year's preſent worth,* &c.

I. *When* U, T, R, *are given to find* P.

$$\text{RULE.}\quad \frac{u - \frac{u}{r^t}}{r - 1} = P.$$

or, by the table, thus,

Multiply the preſent worth of £1 annuity for the time and rate per cent. given, by the annuity, penſion, &c. it will give the anſwer.

EXAMPLES.

EXAMPLES.

29. What is the preſent worth of an annuity of £30 per annum, to continue 7 years, at 6 per cent.?

Anſ. £167..9..5. ,184*d.*

$\frac{30}{1,50363}=19,9517$. $30-19,9517=10,0483$. $\frac{10,0483}{1,06-1}$ $=167,4716$. *By the table* $5,58238\times30=167,4716$.

30. What is the preſent worth of a penſion of £40 per annum, to continue 8 years at 5 per cent.?

Anſ. £258..10..6. 3,264*qrs.*

31. What is the preſent worth of a ſalary of £35, to continue 7 years, at 6 per cent.? *Anſ.* £195..7..7. 3,968 *qrs.*

32. What is the yearly rent of £50, to continue 5 years, worth in ready money, at 5 per cent.?

Anſ. £216..9..5. 2,56 *qrs.*

II. *When* P, T, R, *are given to find* U.

RULE. $\frac{pr^t\times r-pr^t}{r^t-1}=U.$

EXAMPLES.

33. If an annuity be purchaſed for £167..9..5. ,184*d.* to be continued 7 years, at 6 per cent. what is the annuity?

Anſ. $\frac{167,4716\times1,50363\times1,06-167,4716\times1,50363}{1,50363-1}=£30.$

34. If the preſent payment of £258..10..6. 3,264 *qrs.* be made for a ſalary 8 years to come, at 5 per cent. what was the ſalary? *Anſ.* £40.

35. If the preſent payment of £195..7..7. 3,968 *qrs.* were required for a penſion for 7 years to come, at 6 per cent. what is the penſion? *Anſ.* £35.

36. If the preſent worth of an annuity, 5 years to come, be £216..9..5. 2,56 *qrs.* at 5 per cent. what is that annuity?

Anſ. £50.

III. *When* U, P, R, *are given to find* T.

RULE. $\frac{u}{p+u-pr}=r^t$ *which being continually divided by* R, *till nothing remains, the number of thoſe diviſions will be equal to* T.

EXAMPLES.

37. How long may a leaſe of £30 yearly rent be had for £167..9..5. ,184*d.* allowing 6 per cent. to the purchaſer?

Anſ. $\frac{30}{167,4716+30-177,5198}=1,50363$ *which being continually divided, the number of thoſe diviſions will be* = *to* T. = 7 *years.*

38. If £258..10..6. 3,264 *qrs.* is paid down for a leaſe of £40 per annum, at 5 per cent. how long is the leaſe purchaſed for? *Anſ.* 8 *years.*

39. If a houſe is let upon leaſe for £35 per annum, and the leſſee makes preſent payment of £195..7..8, he being allowed 6 per cent. I demand how long the leaſe is purchaſed for? *Anſ.* 7 *years.*

40. For what time may a leaſe of £50 per annum be purchaſed, when preſent payment is made of £216..9..5. 2,56 *qrs.* at 5 per cent.? *Anſ.* 5 *years.*

ANNUITIES, LEASES, *&c. taken in* REVERSION.

To find the preſent worth of annuities, leaſes, &c. *taken in reverſion.*

RULE 1. Find the preſent worth of the annuity, *&c.* at the given rate, and for the time of its continuance; *thus,*

$$\frac{u-\frac{u}{r^t}}{r-1}=P.$$

2. Change P into A, and find what principal being put to intereſt will amount to P at the ſame rate, and for the time to come, before the annuity commences, which will be the preſent worth of the annuity, *&c. thus,*

$$\frac{a}{r^t}=P.$$

EXAMPLES.

EXAMPLES.

41. What is the preſent worth of a reverſion of a leaſe of £40 per annum, to continue for 6 years, but not to commence till the end of 2 years, allowing 6 per cent. to the purchaſer? *Anſ.* £175..1..1. 2,048 *qrs.*

$$\frac{40}{1,41852} = 28,1984. \qquad \frac{40 - 28,1984}{1,06 - 1} = 196,6933 \qquad \frac{196,6933}{1,1236}$$

$$= 175,0563$$

42. What is the preſent worth of a reverſion of a leaſe of £60 per annum, to continue 7 years, but not to commence till the end of 3 years, allowing 5 per cent. to the purchaſer? *Anſ.* £299..18..2,4*d.*

43. There is a leaſe of a houſe at £30 per annum, which is yet in being for 4 years, and the leſſee is deſirous to take a leaſe in reverſion for 7 years, to begin when the old leaſe ſhall be expired, what will be the preſent worth of the ſaid leaſe in reverſion, allowing 5 per cent. to the purchaſer? *Anſ.* £142..16..3. 2,688 *qrs.*

To find the yearly income of an annuity, &c. *taken in reverſion.*

RULE. Find the amount of the preſent worth, at the given rate, and for the time before the annuity commences; *thus*, $pr^t = A$.

Change A into P, and find what yearly rent being ſold will produce P, at the ſame rate, and for the time of its continuance, which will be the yearly ſum required. *thus*, $\frac{pr^t \times r - pr^t}{r^t - 1} = U.$

EXAMPLES.

44. What annuity to be entered upon 2 years hence, and then to continue 6 years, may be purchaſed for £175..1..1. 2,048 *qrs.* at 6 per cent.?

Anſ. 175,0563 × 1,1236 = 196,6933

then $\frac{196,6933 \times 1,41852 \times 1,06 - 279,01337}{1,41852 - 1} = £40.$

45. The preſent worth of a leaſe of an houſe is £299..18. 2,4*d.* taken in reverſion for 7 years, but not to commence till the end of 3 years, allowing 5 per cent. to the purchaſer, what is the yearly rent? *Anſ.* £60.

46. There is a leaſe of a houſe in being for 4 years, and the leſſee being minded to take a leaſe in reverſion for 7 years, to begin when the old leaſe ſhall be expired, paid down £142..16. 3. 2,688*qrs.* what was the yearly rent of the houſe, when the leſſee was allowed 5 per cent. for preſent payment? *Anſ.* £30.

Purchaſing FREEHOLD *or* REAL ESTATES,
Is ſuch as is bought to continue for ever.

I. *When* U, R, *are given to find* W.

RULE. $\frac{u}{r-1}=W.$

EXAMPLES.

47. What is the worth of a freehold eſtate of £50 per annum, allowing 5 per cent. to the buyer?

Anſ. $\frac{50}{1,05-1}=£1000.$

48. What is an eſtate of £140 per annum, to continue for ever, worth in preſent money, allowing 4 per cent. to the buyer? *Anſ.* £3500.

49. If a freehold eſtate of £75 yearly rent was to be ſold, what is it worth, allowing the buyer 6 per cent.?

Anſ. £1250.

II. *When* W, R, *are given to find* U.

RULE. $w \times r-1=U.$

EXAMPLES.

50. If a freehold eſtate is bought for £1000, and the allowance of 5 per cent. is made to the buyer, what is the yearly rent? *Anſ.* 1,05—1=,05. *then* 1000×,05=£50.

51. If an eſtate be ſold for £3500, and 4 per cent. allowed to the buyer, what is the yearly rent? *Anſ.* £140.

52. If a freehold eſtate is bought for £1250 preſent money, and an allowance of 6 per cent. made to the buyer for the ſame, what is the yearly rent? *Anſ.* £75.

III. *When* W, U, *are given to find* R.

RULE. $\frac{w+u}{w}=R.$

EXAMPLES.

EXAMPLES.

53. If an eſtate of £50 per annum is bought for £1000, what is the rate per cent.?

$$\textit{Anſ.}\ \frac{1000+50}{1000}=1{,}05=5\ \textit{per cent.}$$

54. If a freehold eſtate of £140 per annum be bought for £3500, what was the rate per cent. allowed? *Anſ.* 4 *per cent.*

55. If an eſtate of £75 per annum is ſold for £1250, what is the rate per cent. allowed? *Anſ.* 6 *per cent.*

Purchaſing FREEHOLD ESTATES *in* REVERSION.

To find the worth of a freehold eſtate in reverſion.

RULE. Find the worth of the yearly rent, *thus*, $\frac{u}{r-1}=W.$

Change W into A, and find what principal being put to intereſt, will amount to A at the ſame rate, and for the time to come, before the eſtate commences, and that will be the worth of the eſtate in reverſion; *thus*, $\frac{a}{r^t}=P.$

EXAMPLES.

56. If a freehold eſtate of £50 per annum, to commence 4 years hence, is to be ſold, what is it worth, allowing the purchaſer 5 per cent. for preſent payment?

Anſ. $\frac{50}{1{,}05-1}=1000.$ *then* $\frac{1000}{1{,}2155}=$£822..14..1. 2 *qrs.* +

57. What is an eſtate of £200, to continue for ever, but not to commence till the end of 2 years, worth in ready money, allowing the purchaſer 4 per cent.?

Anſ. £4622..15..7. ,44 *qrs.*

58. What is an eſtate of £240 per annum worth in ready money, to continue for ever, but not to commence till the end of 3 years, allowance being made at 6 per cent.?

Anſ. £3358..9..10. 2,24*qrs.*

To find the yearly rent of an eſtate taken in reverſion.

RULE. Find the amount of the worth of the eſtate, at the given rate and time before it commences; *thus*, $wr^t=A.$

Change A into W, and find what yearly rent being ſold will produce U, at the ſame rate; *thus*, $\frac{wr\times r-wr.}{r}=U.$ which will be the yearly rent required.

EXAMPLES.

59. If a freehold eſtate, to commence 4 years hence, is ſold for £822..14..1. ,2*qrs.* allowing the purchaſer 5 per cent. what is the yearly income?

Anſ. 822,70625 × 1,2155 = 1000.

then $\frac{1000 \times 1{,}05 \times 1{,}05 - 1050}{1{,}05}$ = £50.

60. A freehold eſtate is bought for £4622..15..7. ,44*d.* which does not commence till the end of 2 years, the buyer being allowed 4 per cent. for his money; I deſire to know the yearly income? *Anſ.* £200.

61. There is a freehold eſtate ſold for £3358..9..10. 2,24 *qrs.* but not to commence till the expiration of 3 years, allowing 6 per cent. for preſent payment; what is the yearly income? *Anſ.* £240.

REBATE *or* DISCOUNT.

A TABLE ſhewing the preſent worth of £1 due at any number of years, to commence under 31, rebate at 5 and 6 *per cent.*

Years.	5 *Rates* 6		*Years.*	5 *Rates* 6	
1	,952381	,943396	16	,458111	,393647
2	,907030	,889996	17	,436296	,371364
3	,863838	,839619	18	,415520	,350343
4	,822702	,792093	19	,395734	,330513
5	,783526	,747258	20	,376889	,311804
6	,746215	,704960	21	,358942	,294155
7	,710682	,665057	22	,341849	,277505
8	,676839	,627412	23	,325571	,261797
9	,644609	,591898	24	,310067	,246978
10	,613913	,558394	25	,295302	,232998
11	,584679	,526787	26	,281240	,219810
12	,556837	,496969	27	,267848	,207368
13	,530321	,468839	28	,255093	,195630
14	,505068	,442301	29	,242946	,184556
15	,481017	,417265	30	,231377	,174110

Note. *The above table is made thus:* 1 ÷ 1,05 = ,952381 *firſt year's preſent worth; and* ,952381 ÷ 1,05 = ,90703 *ſecond year, and* ,90703 ÷ 1,05 = ,863838 *third year, &c.*

I. *When* S, T, R, *are given to find* P.

RULE. $\frac{s}{r^t} = P.$

EXAMPLES.

1. What is the preſent worth of £315..12..4. ,2*d.* payable 4 years hence, at 6 per cent.?

Anſ. 1,06 × 1,06 × 1,06 × 1,06 = 1,26247. *then*

	by the table.
$\frac{315,6175}{1,26247} = £250$	315,6175
	,792093
	249,99841 24275

2. If £344..14..9. 1,92*qrs.* be payable in 7 years time, what is the preſent worth, rebate being made at 5 per cent.? *Anſ.* £245.

3. There is a debt of £441..17..3. 1,92*qrs.* which is payable 4 years hence, but it is agreed to be paid in preſent money; what ſum muſt the creditor receive, rebate being made at 6 per cent.? *Anſ.* £350.

II. *When* P, T, R, *are given to find* S.

RULE. $p \times r^t = S.$

EXAMPLES.

4. If a ſum of money due 4 years hence produce £250 for the preſent payment, rebate being made at 6 per cent. what was the ſum firſt due?

Anſ. 250 × 1,26247 = £315..12..4. ,2*d.*

5. If £245 be received for a debt payable 7 years hence, and an allowance of 5 per cent. to the debtor for preſent payment, what was the debt? *Anſ.* £344..14..9. 1,92*qrs.*

6. There is a ſum of money due at the expiration of 4 years, but the creditor agrees to take £350 for preſent payment allowing 9 per cent. what was the debt?

Anſ. £441..17..3. 1,92*qrs.*

III. *When* S, P, R, *are given to find* T.

RULE. $\frac{s}{p} = r^t$ *which being continually divided by* R, *till nothing remains, the number of theſe diviſions will be equal to* T.

EXAMPLES.

7. The preſent payment of £250 is made for a debt of £315..12..4. ,2*d.* rebate at 6 per cent. in what time was the debt payable?

Anſ. $\frac{315,6175}{250} = 1,26247$ *which being continually divided, thoſe diviſions will be equal to* 4 *= the number of years.*

8. A perſon receives £245 now for a debt of £344..14..9. 1,92*qrs.* rebate being made at 5 per cent. I demand in what time the debt was payable? *Anſ.* 7 *years.*

9. There is a debt of £441..17..3. 1,92*qrs.* due at a certain time to come, but 6 per cent. being allowed to the debtor for the preſent payment of £350, I deſire to know in what time the ſum ſhould have been made without any rebate? *Anſ.* 4 *years.*

IV. *When* S, P, T, *are given to find* R.

RULE. $\frac{s}{p} = r^t$ *which being extracted by the rules of extraction, (the time given in the queſtion ſhewing the power) will be equal to* R.

EXAMPLES.

10. A debt of £315..12..4. ,2*d.* is due 4 years hence, but it is agreed to take £250 now, what is the rate per cent. that the rebate is made at?

Anſ. $\frac{315,6175}{250} = 1,26247$; $\sqrt[4]{1,26247} = 1,06 = 6$ *per cent.*

11. The preſent worth of £344..14..9. 1,22*qrs.* payable 7 years hence, is £245, at what rate per cent. is rebate made? *Anſ.* 5 *per cent.*

12. There is a debt of £441..17..3. 1,92*qrs.* payable in 4 years time. but is agreed to take £350 preſent payment, I deſire to know what rate per cent. rebate is made at?

Anſ. 6 *per cent.*

THE

THE

TUTOR's ASSISTANT.

PART IV.

DUODECIMALS:

OR, WHAT IS GENERALLY CALLED

Croſs Multiplication, and ſquaring of Dimenſions by Artificers and Workmen.

RULE *for multiplying* DUODECIMALLY.

1. UNDER the Multiplicand write the correſponding denominations of the Multiplier.

2. Multiply each term in the Multiplicand (beginning at the loweſt) by the feet in the Multiplier; write each reſult under its reſpective term, obſerving to carry an unit for every 12, from each lower denomination to its next ſuperior.

3. In the ſame manner multiply the Multiplicand by the primes in the Multiplier, and write the reſult of each term one place more to the right-hand of thoſe in the Multiplicand.

4. Work in the ſame manner with the ſeconds in the Multiplier, ſetting the reſult of each term two places to the right hand of thoſe in the Multiplicand, and ſo on for thirds, fourths, &c.

EXAMPLES.

EXAMPLES.

1. Multiply *f. in.* 7 . 9 by *f. in.* 3 . 6

Croſs Multiplication.	*Practice.*	*Duodecimals.*	*Decimals.*
7 × 9	6½ 7 · 9	7 · 9	7,75
3 × 6	3 . 6	3 . 6	3, 5
21.-.-=7×3	23 · 3	23 · 3. ×3	3875
2.3.-=9×3	3 . 10.6	3 . 10. 6×6	2325
3.6.-=7×6	27 . 1 . 6	27 . 1 . 6	27,125
-.4.6=9×6			
27.1.6			

	f. in.		*f. in.*		*f. in.*
2. Multiply	8. 5.	by	4. 7.	*Facit*	38. 6.11
3. Multiply	9.8.	by	7. 6.	*Facit*	72. 6.
4. Multiply	8.1.	by	3. 5.	*Facit*	27. 7. 5
5. Multiply	7.6.	by	5. 9.	*Facit*	43. 1. 6
6. Multiply	4.7.	by	3.10.	*Facit*	17. 6.10
7. Multiply	7.5.9″	by	3. 5.3″	*Facit*	25. 8.6.2.3
8. Multiply	10.4.5.	by	7. 8.6.	*Facit*	79.11.0.6.6.
9. Multiply	75.7	by	9. 8.	*Facit*	730. 7.8.
10. Multiply	97.8	by	8. 9.	*Facit*	854. 7.
11. Multiply	57.9	by	9. 5.	*Facit*	543. 9.9.
12. Multiply	75.9.	by	17. 7.	*Facit*	1331.11.3.
13. Multiply	87.5.	by	35. 8.	*Facit*	3117.10.4.
14. Multiply	179.3.	by	38.10.	*Facit*	6960. 10.6.
15. Multiply	259.2.	by	48.11.	*Facit*	12677. 6.19.
16. Multiply	257.9.	by	39.11.	*Facit*	10288. 6. 3.
17. Multiply	311.4.7.	by	36. 7.5.	*Facit*	11402. 2.4.11.11.
18. Multiply	321.7.3.	by	9. 3.6.	*Facit*	2988. 2. 10.4. 6.

The APPLICATION.

Artificer's work is computed by different meaſures, *viz.*

1. Glazing and maſon's flatwork by the foot.
2. Painting, plaiſtering, paving, *&c.* by the yard.
3. Partitioning, flooring, roofing, tyling, *&c.* by the ſquare of 100 feet.
4. Brickwork, *&c.* by the rod or 16 feet ½, whoſe ſquare is 272¼.

MEASURING

MEASURING *by the* FOOT SQUARE, *as* GLAZIERS *and* MASONS *Flatwork.*

EXAMPLES.

19. There is a houſe with 3 tier of windows, 3 in a tier, the height of the firſt tier 7 feet 10 inches, the ſecond 6 feet 8 inches, and the third 5 feet 4 inches, the breadth of each is 3 feet 11 inches, what will the glazing come to at 14*d.* per foot?

Duodecimals.

7 . 10 *the*
6 . 8 *heights*
5 . 4 *added*

19 . 10
3 = *windows*

59 . 6 *in a tier.*
3 . 11 *in breadth.*

178 . 6
54 . 6 . 6

233 . — . 6

feet. in. pts.
233 .—..6 *at* 14*d. per foot.*

2*d.* $\frac{1}{6}$ 233 = 1*s.*
38..10 = 2*d.*
$\frac{1}{2}$ = 6 *parts.*

2|0(27|1..10$\frac{1}{2}$

£13..11..10$\frac{1}{2}$ *Anſ.*

20. What is the worth of 8 ſquares of glaſs, each meaſuring 4 feet 10 inches long, and 2 feet 11 inches broad, at 4*d* $\frac{1}{8}$ per foot? *Anſ.* £1..18..9.

21. There are 8 windows to be glazed, each meaſures 1 foot 6 inches wide, and 3 feet in height, how much will they come to at 7*d.* $\frac{1}{4}$ per foot? *Anſ.* £1..3..3.

22. What is the price of a marble ſlab, whoſe length is 5 feet 7 inches, and the breadth 1 foot 10 inches, at 6*s.* per foot? *Anſ.* £3..1..5.

MEASURING *by the* YARD SQUARE, *as* PAVIORS, PAINTERS, PLAISTERERS, *and* JOINERS.

NOTE. *Divide the ſquare feet by* 9, *and it will give the number of ſquare yards.*

EXAMPLES.

23. A room is to be ceiled, whoſe length is 74 feet 9 inches, and width 11 feet 6 inches, what will it come to at 3*s.* 10*d.* $\frac{1}{2}$ per yard? *Anſ.* £18..10..1.

24. What

24. What will the paving of a court-yard come to, at 4*d*. ¾ per yard, the length being 58 feet 6 inches, and breadth 54 feet 9 inches? *Anſ.* £.7..–.10

25. A room painted 97 feet 8 inches about, and 9 feet 10 inches high, what does it come to at 2*s*. 8*d* ½ per yard?

Anſ. £14..11..1.

26. What is the content of a piece of wainſcotting in yards ſquare, that is 8 feet 3 inches long, and 6 feet 6 inches broad, and what will it come to at 6*s*. 7*d* ½ per yard? *Anſ.* £1..19..5.

27. What will the paving a court-yard come to, at 3*s*. 2*d*. per yard, if the length be 27 feet 10 inches, and the breadth 14 feet 9 inches? *Anſ.* £7..4..5.

28. A perſon has paved a court-yard 42 feet 9 inches in front, and 68 feet 6 inches in depth, and in this he laid a foot-way the depth of the court, of 5 feet 6 inches in breadth: the foot-way is laid with Purbeck ſtone, at 3*s*. 6*d*. per yard, and the reſt with pebbles, at 3*s*. per yard, what will the whole come to? *Anſ.* £49..17..–

29. What will the plaiſtering a ceiling, at 10*d*. per yard, come to, ſuppoſing the length 21 feet 8 inches, and the breadth 14 feet 10 inches? *Anſ.* £1..9..9.

30. What will the wainſcotting a room come to, at 6*s*. per ſquare yard, ſuppoſing the height of the room (taking in the cornice and moulding) is 12 feet 6 inches, and the compaſs 83 feet 8 inches, the three window ſhutters each 7 feet 8 inches, by 3 feet 6 inches; and the door 7 feet by 3 feet 6 inches; the ſhutters and door being worked on both ſides, is reckoned work and half work?

Anſ. £36..12..2½.

MEASURING *by the* SQUARE *of* 100 *Feet, as* FLOORING, PARTITIONING, ROOFING, TYLING, *&c.*

EXAMPLES.

31. In 173 feet 10 inches in length, and 10 feet 7 inches in height of partitioning, how many ſquares?

Anſ. 18 *ſquares*, 39 *feet*, 8 *inches*, 10 *p.*

32. If a houſe of 3 ſtories, beſides the ground floor, was to be floored at £6..10..– per ſquare, and the houſe meaſured 20 feet 8 inches, by 16 feet 9 inches: there are 7 fire places, whoſe meaſures are two of 6 feet, by 4 feet 6 inches each, two of 6 feet by 5 feet 4 inches each, and two of 5 feet 8 inches, by 4 feet 8 inches, and the ſeventh of 5 feet 2 inches, by 4 feet, and the well hole for the ſtairs

ſtairs is 10 feet 6 inches, by 8 feet 9 inches, what will the whole come to? *Anſ.* £53..13..3¼.

33. If a houſe meaſures within the walls 52 feet 8 inches in length, and 30 feet 6 inches in breadth, and the roof be of a true pitch, what will it come to roofing, at 10*s.* 6*d.* per ſquare? *Anſ.* £12..12..11¾.

NOTE. *In tyling, roofing, and ſlating, it is cuſtomary to reckon the flat, and half of any building within the wall, to be the meaſure the roof of that building, when the ſaid roof is of a true pitch,* i. e. *when the rafters are ½ of the breadth of the building; but if the roof is more or leſs than the true pitch, they meaſure from one ſide to the other, with a rod or ſtring.*

34. What will the tyling of a barn coſt, at 25*s.* 6*d.* per ſquare, the length being 43 feet 10 inches, and breadth 27 feet 5 inches on the flat, the eave boards projecting 16 inches on each ſide? *Anſ.* £24..9..5½.

MEASURING *by the* ROD.

NOTE. *Bricklayers always value their work at the rate of a brick and a half thick; and if the thickneſs of the wall is more or leſs, it muſt be reduced to that thickneſs by this*

RULE. Multiply the area of the wall by the number of half bricks the thickneſs of the wall is of; the product, divided by 3, gives the area.

EXAMPLES.

35. If the area of a wall be 4085 feet, and the thickneſs two bricks and a half thick, how many rods doth it contain? *Anſ.* 25 *rods.*

36. If a garden wall be 254 feet round, and 12 feet 7 inches high, and 3 bricks thick, how many rods doth it contain? *Anſ.* 23 *rods,* 136 *feet.*

37. How many ſquare rods are there in a wall 62½ feet long, 14 feet 8 inches high, and 2½ bricks thick?

Anſ. 5 *rods,* 167 *feet.*

38. If the ſide walls of an houſe be 28 feet 10 inches in length, and the height of the roof from the ground 53 feet 8 inches, and the gable (or triangular part at top) to riſe 42 courſe of bricks (reckoning 4 courſe to a foot). Now, 20 feet high is 2½ bricks thick, 20 feet more, at 2 bricks thick, 15 feet 8 inches more, at 1½ brick thick, and the gable at 1 brick thick, what will the whole work come to, at £5..16..–. per rod? *Anſ.* £48..13..5½.

Multiplying ſeveral figures by ſeveral, and the product to be produced in one line only.

RULE. Multiply the units of the multiplicand by the units of the multiplier, ſetting down the units of the product, and carry the tens; next multiply the tens in the multiplicand by the units of the multiplier, to which add the product of the units of the multiplicand multiplied by the tens in the multiplier, and the tens carried; then multiply the hundreds in the multiplicand by the units of the multiplier, adding the product of the tens in the multiplicand multiplied by the tens in the multiplier, and the units of the multiplicand by the hundreds in the multiplier; and ſo proceed till you have multiplied the multiplicand all through, by every figure in the multiplier.

EXAMPLES.

Multiply - - 35234	35234
by - - 52424	52424
1847107216	140936
	70468
	140936
	70468
	176170
	1847107216

EXPLANATION.

Firſt, $4\times4=16$, that is, 6 and carry 1. *Secondly*, $3\times4+4\times2$, and 1 that is carried was 21, ſet down 1 and carry 2. *Thirdly*, $2\times4+3\times2+4\times4+2$ carried $=32$; that is, 2 and carry 3. *Fourthly*, $5\times4+2\times2+3\times4+4\times2+3$ carried $=47$; ſet down 7 and carry 4. *Fifthly*, $3\times4+5\times2+2\times4+3\times2+4\times5+4$ carried $=60$; ſet down 0 and carry 6. *Sixthly*, $3\times2+5\times4+2\times2+3\times5+6$ carried $=51$; ſet down 1 and carry 5. *Seventhly*, $3\times4+5\times2+2\times5+5$ carried $=37$, that is 7 and carry 3. *Eighthly*, $3\times2+5\times5+3$ carried $=34$; ſet down 4 and carry 3. *Laſtly*, $3\times5+3$ carried $=18$; which being multiplied by the laſt figure in the multiplier, ſet the whole down, and the work is finiſhed.

THE

THE TUTOR's ASSISTANT.

PART V.

A Collection of QUESTIONS *ſet down promiſcuouſly, for the greater Trial of the foregoing* RULES.

1. WRITE down two millions, five hundred and two thouſand, two hundred and five.

2. What is the value of 14 barrels of ſoap, at 4*d.* $\frac{1}{2}$ per lb. each barrel containing 254 lb.? *Anſ.* £66..13..6.

3. If £100 principal gain £5 intereſt in 12 months, what principal will gain £20 in 8 months? *Anſ.* £600.

4. What number is that from which, if the ſquare of 14 is deducted, and to the remainder the ſquare of 12 be added, the ſum will be 250? *Anſ.* 302.

5. A and B trade together; A put in £320 for 5 months, B £460 for 3 months, and they gained £100, what muſt each man receive? *Anſ.* A £53..13..9. $\frac{270}{575}$.
and B £46..6..2. $\frac{305}{575}$.

6. How many yards of cloth, at 17*s.* 6*d.* per yard, can I have for 13 cwt. 2 qrs. of wool, at 14*d.* per lb.?
Anſ. 100 *yards*, 3*qrs.* $\frac{1}{5}$.

7. What number added to the cube of 21, will make the ſum equal to 113 times 147? *Anſ.* 7350.

8. If I buy 1000 ells Flemiſh of linen for £90, what may I ſell it at per ell in London, to gain £10 by the whole? *Anſ.* 3*s.* 4*d. per ell.*

9. A has 648 yards of cloth, at 14*s.* per yard, ready money, but in barter will have 16*s.* B has wine at £42 per tun, ready money, the queſtion is, how much wine muſt be given for the cloth, and what is the price of a tun of wine in barter? *Anſ.* £48 *the tun, and* 10 *tun*, 3*hhds.* 12 *gal. of wine muſt be given for the cloth.*

10. A jeweller ſold jewels to the value of £1200, for which he received in part 876 French piſtoles, at 16*s.* 6*d.* each, what ſum remains unpaid? *Anſ* £477..6..–.

11. An oilman bought 417 cwt. 1 qr. 15 lb. groſs weight of train oil, tare 20 lb. per 112 lb. how many neat gallons were there, allowing 7 ½ lb. to a gallon? *Anſ.* 5120 *gallons.*

12. I bought threeſcore pieces of Holland for three times as many pounds, and ſold them again for four times as much; but if they had coſt me as much as I ſold them for, what ſhould I have ſold them for to gain after the ſame rate? *Anſ.* £320.

13. What number taken from the ſquare of 54 will leave 19 times 46? *Anſ.* 2042.

14. If I buy a yard of cloth for 14*s.* 6*d.* and ſell it for 16*s.* 9*d.* what do I gain per cent.? *Anſ.* £15..10..4..$17\frac{24}{43}$.

15. Bought 27 bags of ginger, each weighing groſs 84 lb. ¾, tare 1 lb. ⅜ per bag, trett 4 lb. per 104 lb. what do they come to at 8*d.* ½ per lb? *Anſ.* £76..13..3½.

16. If ⅔ of an ounce coſt ⅞ of a ſhilling, what will ⅚ of a lb. coſt? *Anſ.* 17*s.* 6*d.*

17. If ⅚ of a gallon coſt ⅝ of a £. what will ⅘ of a tun coſt? *Anſ.* £105.

18. A young man received £210, which was ⅔ of his eldeſt brother's portion; now three times the eldeſt brother's portion was half of the father's eſtate, I demand how much the eſtate was? *Anſ.* 1890.

19. If the ſalary of an officer be £48, 5 per annum, what muſt he receive for 232 days? *Anſ.* £30..16..6,2*qrs.*

20. A gentleman ſpends one day with another £1..7..10½, and at the year's end layeth up £340, what is his yearly income? *Anſ.* £848..14..4½.

21. A lady's fortune conſiſted of a cabinet, worth £200. containing 16 drawers, each having two partitions, each of which contained £37 and two crowns, pray what was her portion? *Anſ.* £1400.

22. A has 13 fother of lead to ſend abroad, each being 19½ times 112 lb. B has 39 caſks of tin, each 388 lb. how many ounces difference is there in the weight of theſe commodities? *Anſ.* 212160 *oz.*

23. A captain and 160 ſailors took a prize worth £1360, of which the captain had ⅓ for his ſhare, and the reſt was equally divided among the ſailors, what was each man's part? *Anſ. The captain had,* £272, *and each ſailor* £6..16..–.

24. What number is that, to which if you add $7\frac{2}{3}$, the whole will be $12\frac{1}{4}$? *Anſ.* $4\frac{7}{12}$.

25. An uſurer put out £75 for 12 months, and received for principal and intereſt £81, I demand at what rate per cent. he received intereſt? *Anſ.* 8 *per cent.*

26. What

26. What will £956 amount to in 7½ years, at 5 per cent. ſimple intereſt? *Anſ.* £1314..10..–.

27. At what rate per cent. will £956 amount to £1314 10*s.* in 7½ years, at ſimple intereſt? *Anſ.* 5 *per cent.*

28. If for £1..4..– I have 1200lb. weight carried 36 miles, how many lb. weight can I have carried 24 miles for the ſame money? *Anſ.* 1800 *lb.*

29. If 8 cannons in one day ſpend 48 barrels of powder, I demand how many barrels 24 cannons will ſpend in 22 days? *Anſ.* 3168.

30. What number is that, which being multiplied by ⅔, will produce ¼? *Anſ.* ⅜.

31. A has 24 cows worth 72*s.* each, and B 7 horſes worth £13 a piece, how much will make good the difference, in caſe they interchange their ſaid drove of cattle?

Anſ. £4..12..–.

32. A man dies and leaves £120 to be given to three perſons: *viz.* A, B and C; to A a ſhare unknown; B twice as much as A, and C as much as A and B; what was the ſhare of each? *Anſ.* A £20, B £40, *and* C £60.

33. A perſon dying, left his widow £1780. and £1250, to each of his four children; he had been 25½ years in trade, and had cleared (at an average) £126 a-year, what had he to begin with? *Anſ.* £3567.

34. There is the ſum of £1000 to be divided among 3 men, in ſuch manner, that if A has £3, B ſhall have £5, and C £8, how much muſt each man have?

Anſ. A 187..10..–, B £312..10..–, *and* C £500.

35. A piece of wainſcot is 8 feet 6 inches and ½ long, and 2 feet 9 inches ¾ broad, what is the ſuperficial content? *Anſ.* 24 *feet* 0..3″..4..6.

36. How many changes may be rung on 6 bells? *Anſ.* 720.

37. A merchant in Amſterdam is indebted to another in London £642, and would pay it in Spaniſh guilders, at 2*s.* per piece, how many muſt the Engliſh merchant receive? *Anſ.* 6420.

38. If 360 men be in garriſon, and have proviſion for 6 months; but hearing of no relief at the end of 5 months, how many men muſt depart, that the proviſions may laſt ſo much longer. *Anſ.* 288 *men.*

39. The leſs of two numbers is 187, their difference 34, the ſquare of the product is required? *Anſ.* 1707920929.

40. A butcher ſends his man with £216 to a fair to buy cattle; oxen at £11; cows at 40*s*; colts at £1..5..–, and

hogs at £1..15..– per piece, and of each a like number, how many of each ſort did he buy?

Anſ. 13 *of each ſort, and* 8 *over.*

41. What number added to 11 $\frac{5}{7}$ will produce 36 $\frac{337}{616}$?

Anſ. 24 $\frac{51}{616}$.

42. What number multiplied by $\frac{3}{7}$ will produce 11 $\frac{9}{17}$?

Anſ. 26 $\frac{46}{51}$.

43. A man had 12 ſons; the youngeſt was 3 years old, and the eldeſt 58; they increaſed in arithmetical progreſſion, what was the common difference of their ages?

Anſ. 5 *years.*

44. What is the value of 179 hogſheads of tobacco, each weighing 13 cwt. at £2..7..1 per cwt? *Anſ.* 5478..2..11.

45. My factor ſends me word he has bought goods to the value of £500..13. 6 upon my account, what will his commiſſion come to at 3$\frac{1}{2}$ per cent? *Anſ.* £17..10..5. 2*qrs.* $\frac{68}{100}$.

46. Miſs Kitty told her ſiſter Charlotte, whoſe father had before left them £13200 a-piece, that their grandmother by will had raiſed her fortune to £15000, and had made her own £20000, what did the old lady leave them? *Anſ.* £8600.

47. A ſnail in getting up a may-pole, only 20 feet high, was obſerved to climb 8 feet every day, but every night he came down again 4 feet; in what time by this method, did he reach the top of the pole? *Anſ.* 4 *days.*

48. If the $\frac{1}{3}$ of 6 be 3, what will $\frac{1}{4}$ of 20 be? *Anſ.* 7 $\frac{1}{2}$.

49. What is the difference between 14676, and the fourth of itſelf? *Anſ.* 11007.

50. There is in three bags the ſum of £1468; viz. in the firſt bag £461, in the ſecond £581, what was in the third bag? *Anſ.* £426.

51. What is the decimal of 3qrs. 14lb. of an cwt. *Anſ.*,875.

52. How many lb. of ſugar, at 4*d.* $\frac{1}{2}$ per lb. muſt be given in barter for 60 groſs of incle, at 8*s.* 8*d.* per groſs?

Anſ 1386$\frac{2}{3}$.

53. If I buy yarn for 9*d.* the lb. and ſell it again for 13*d.* $\frac{1}{2}$ per lb. what is the gain per cent.? *Anſ.* £50.

54. A tobacconiſt would mix 20 lb. of tobacco, at 9*d.* per lb. with 60 lb. at 12*d.* per lb. 40 lb. at 18*d.* per lb. and with 12 lb. at 2*s.* per lb. what is a lb. of this mixture worth?

Anſ. 1*s.* 2*d.* $\frac{1}{4}$. $\frac{2}{11}$.

55. What is the value of 14 barrels of ſoap, at 4*d.* $\frac{1}{2}$ per lb. each barrel containing 254 lb? *Anſ.* £66..13..6.

56. Two perſons, A and B, owe ſeveral debts; the leſſer debt being that of A, is £2173, the difference is £371, what is the debt of B? *Anſ.* £2544.

57. What is the difference between twice eight and twenty and twice twenty-eight: as alſo between twice five and fifty and twice fifty-five? *Anſ.* 20 *and* 50.

58. What number taken from the ſquare of 54 will leave 19 times 46? *Anſ.* 2042.

59. A ſchoolmaſter being aſked how many ſcholars he had, ſaid, If I had as many more, half as many, and 1 quarter as many, I ſhould have 99, how many had he? *Anſ.* 36.

60. An ancient lady being aſked how old ſhe was, to avoid a direct anſwer, ſaid, I have 9 children, and there are 3 years between the birth of each of them; the eldeſt was born when I was 19 years old, which is now exactly the age of the youngeſt; how old was the lady? *Anſ.* 62.

61. What number is that which being added to 168 makes the ſum to be 706? *Anſ.* 538.

62. From £100 borrowed, take 72 paid;
'Twas a virgin that lent it, what's due to the maid?
Anſ. £28.

63. If when wheat is 4*s.* per buſhel, the 20 penny loaf weighs 18 lb. what muſt the ſaid 20 penny loaf weigh, when wheat is 6*s.* the buſhel? *Anſ.* 12 *lb.*

64. Whereas a noble and a mark juſt 15 yards did buy; How many ells of the ſame cloth for £50 had I? *Anſ.* 600.

65. A broker bought for his principal in the year 1720, £400 capital ſtock in the South Sea, at £950 per cent. and ſold it again when it was worth but £130 per cent. how much was loſt in the whole? *Anſ* £2080.

66. What number added to the 43d part of 4429, will make the ſum 240? *Anſ.* 137.

67. What number deducted from the 26th part of 2262 will leave the 87th part of the ſame? *Anſ.* 61.

68. A gentleman went to ſea at 17 years of age; 8 years after that, he had a ſon born, who lived 46 years, and died before his father; after whom the father lived twice 20 years, and then died alſo; what was the age of the father when he died? *Anſ.* 111 *years.*

69. C hath candles at 6*s.* per dozen ready money, but in barter will have 6*s.* 6*d.* per dozen; D hath cotton at 9*d.* per lb. ready money; I demand what price the cotton muſt be at in barter; alſo how much cotton muſt be bartered for 100 doz. of candles? *Anſ. the cotton at* 9*d.* 3 *qrs. per lb. and* 7 *cwt.* 0 *qrs.* 16 *lb. of cotton muſt be given for* 100 *doz. of candles.*

70. The ſum of two numbers is 360, the leſs 114, what is their difference, product and larger quote?

Anſ. 132 *difference*, 28044 *product*, 2$\frac{3}{7}$ *quot.*

71. A brigade of horſe, conſiſting of 384 men, is to be formed into a ſquare body, having 32 men in front, how many ranks will there be? *Anſ.* 12.

72. If a clerk's ſalary be £73 a-year, what is that per day? *Anſ.* 4*s.*

73. B hath an eſtate of £53 per annum, and payeth 5*s.* 10*d.* to the ſubſidy, what muſt C pay, whoſe eſtate is worth £100 per annum? *Anſ.* 11*s.* 0*d.* $\frac{4}{53}$.

74. If I buy 100 yards of ribband at 3 yards for a ſhilling, and 100 more at 2 yards for a ſhilling, and ſell it at the rate of 5 yards for 2 ſhillings, whether do I get or loſe, and how much? *Anſ. loſe* 3*s.* 4*d.*

75. What is the value of $\frac{5}{8}$ of 20*s.*? *Anſ.* 12*s.* 6*d.*

76. What number is that, from which if you take $\frac{3}{5}$. the remainder will be $\frac{1}{8}$? *Anſ.* $\frac{29}{40}$.

77. My purſe and money quoth Dick, are worth 12*s.* 8*d.* but the money is worth 7 of the purſe, pray what is the ſum therein? *Anſ.* 11*s.* 1*d.*

78. What number is that which maketh 9 to be the $\frac{3}{4}$ of it? *Anſ.* 13 $\frac{1}{2}$.

79. A maltſter has ſeveral ſorts of malt, one at 4*s.* 6*d.* another at 4*s.* and a third at 3*s.* 6*d.* a buſhel; to mix an equal quantity of each, what muſt be the price of a buſhel? *Anſ.* 4*s.*

80. A farmer is willing to make a mixture of rye at 4*s.* a buſhel, barley at 3*s.* and oats at 2*s.* how much muſt he take of each to ſell it at 2*s.* 6*d.* the buſhel?

Anſ. 6 *of rye*, 6 *of barley, and* 24 *of oats.*

81. If $\frac{3}{8}$ of a ſhip be worth £3740, what is the worth of the whole? *Anſ.* £9973..6..8.

82. A perſon ſaid he had 20 children, and that it happened there was a year and a half between each of their ages; his eldeſt ſon was born when he was 24 years old, and the age of his youngeſt is 21, what was the father's age?

Anſ. 73 $\frac{1}{2}$ *years.*

83. Bought a caſk of wine for £62..8..–, how many gallons were in the ſame, when a gallon was valued at 5*s.* 4*d.*? *Anſ.* 234.

84. B owes C £296..17..–, but he compounds for 7*s.* 6*d.* in the pound, what muſt C receive for his debt?

Anſ. £111..6..4 $\frac{1}{2}$.

85. How many dozen of ſtockings, at 11 groats per pair, may I buy for £190..12..–? *Anſ.* 86 *doz.* 7 *pair*, $\frac{28}{44}$.

86. A ſheepfold was robbed 3 nights ſucceſſively; the firſt night half the ſheep were ſtolen, and half a ſheep more;

the ſecond night half the remainder were loſt, and half a ſheep more; the laſt night they took half that were left, and half a ſheep more; by which time they were reduced to 20; how many were they at firſt? *Anſ.* 167.

87. The Spectator's club of fat people, tho' it conſiſted but of 15 perſons, is ſaid to weigh no leſs than 3 tons, how much at an equality, was that per man? *Anſ.* 4 *cwt.*

88. A merry young fellow in a ſmall time got the better of $\frac{1}{3}$ of his fortune; by advice of his friends, he gave £2200 for an Exempt's place in the Guards; his profuſion continued till he had no more than 880 guineas left, which he found by computation was $\frac{3}{20}$ part of his money after the commiſſion was bought; pray what was his fortune at firſt? *Anſ.* £10450.

89. B owes C £395..18..–, but compounds the whole debt for £100..12..–, what is that in the pound?

Anſ. 5*s.* 0*d.* $\frac{3}{4}$ $\frac{7}{19}$ $\frac{4}{18}$ $\frac{6}{8}$.

90. How many dollars, at 4*s.* 4*d.* each, muſt be given for 360 guilders, at 2*s.* 2*d.* each? *Anſ.* 180.

91. Four men have a ſum of money to be divided amongſt them in ſuch a manner, that the firſt ſhall have $\frac{1}{3}$ of it, the ſecond $\frac{1}{4}$, the third $\frac{1}{6}$, and the fourth the remainder, which is 28, what is the ſum? *Anſ.* £112.

92. What is the amount of £1000 for 5 years $\frac{1}{2}$, at [illegible] per cent. ſimple intereſt? *Anſ.* £1261..5..–.

93. Sold goods amounting to the value of £700 for 2 4 months, what is the preſent worth, at 5 per cent. ſimple intereſt? *Anſ.* £682..19..5. 2*qrs.*

94. A room 30 feet long, and 18 feet wide, is to be covered with painted cloth, how many yards of $\frac{3}{4}$ wide will cover it? *Anſ.* 80 *yards.*

95. There are two numbers, the one 48, the other twice as much, what is the difference between their ſum and difference? *Anſ.* 96.

96. Hetty told her brother George, that tho' her fortune on her marriage took £19312 out of her family, it was but $\frac{3}{5}$ of two years rent; Heaven be praiſed! of his yearly income pray what was that? *Anſ.* £1693..6..8 *a year.*

97. There are two numbers, the one 25, the other the ſquare of 25, I demand the ſquare root of the ſum of their ſquares? *Anſ.* 625,4998.

98. Says B to C, if I had 4 of your ſheep, I ſhould have as many as you; and ſays C to B, if I had four of yours, I ſhould have twice as many as you; how many had each?

Anſ. B 20, C 28.

99. B.

99. B, C, and D trading together gained £120, which is to be ſhared according to each man's ſtock; B put in £140, C £300, and D £160, what is each man's ſhare?

Anſ. B £28, C £60, D £32.

100. A gentleman having 50*s.* to pay amongſt his labourers for a day's work, would give to every boy 6*d.* to every woman 8*d.* and to every man 16*d.* the number of boys, women, and men, was the ſame, I demand the number of each? *Anſ.* 20 *of each.*

101. There are 3 numbers, 17, 19 and 48, I demand the difference between the ſum of the ſquares of the firſt and laſt, and the cube of the middlemoſt?

Anſ. 4266.

102. A ſtone that meaſures 4 feet 6 inches long, 2 feet 9 inches broad, and 3 feet 4 inches deep, how many ſolid feet doth it contain? *Anſ.* 41 *feet*, 3 *inches.*

103. What does the whole pay of a man of war's crew of 640 ſailors amount to for 32 months ſervice, each man's pay being 22*s.* 6*d.* per month? *Anſ.* £23040.

104. If I have an eſtate of £470 per annum, what may I expend daily, and yet lay up £130 per annum?

Anſ. 18*s.* 7*d.* $\frac{1}{2}\frac{00}{365}$.

105. What number is that, which being divided by 19, the quotient will be 72? *Anſ.* 1368.

106. Reduce $13\frac{1}{2}$ buſhels of coals to the fraction of a chaldron. *Facit* $\frac{3}{8}$.

107. Bought 28 qrs. 2 buſh. of wheat, at 4*s.* 6*d.* per buſhel, what does it come to? *Anſ.* £50..17..-.

108. How many pounds of coffee, at 5*s.* 9*d.* per lb. is equal in value to 426 lb. of tea, at 13*s.* 4*d.* per lb.?

Anſ. 987 $\frac{57}{69}$.

109. What is the value of 27 dozen 10 lb. of candles, at 5*d.* per lb.? *Anſ.* £6..19..2.

110. A traveller would change 500 French crowns, at 4*s.* 6*d.* per crown, into ſterling money, but he muſt pay a half-penny per crown for change, how much muſt he receive? *Anſ.* £111..9..2.

111. There are two numbers, the one 63, and the other $\frac{2}{3}$ as much, I demand the product of their ſquares, and the difference of their product and ſum?

Anſ. Product of their ſquares 3938240,25. *difference* 1890.

112. B and C traded together, and gained £100; B put in £640: C put in ſo much, that he might receive £60 of the gain; I demand how much C put in?

Anſ. £960.

113. Of what principal ſum did £20 intereſt ariſe in 1 year, at the rate of 5 per cent. per annum? *Anſ.* £400.

114. Having bought 40 yards of cloth, at 8*s.* per yard, and 70 yards at 12*s.* what is the value of both pieces?
Anſ. £53.

115. Two men depart both from one place, the one goes North, the other South: the one goes 7 miles, and the other 11 miles a-day, how far are they diſtant at the 12th day of their departure? *Anſ.* 216 *miles.*

116. In 672 Spaniſh guilders of 2*s.* each, how many French piſtoles, at 17*s.* 6*d.* per piece? *Anſ.* $76\frac{28}{35}$.

117. In 7 cheeſes, each weighing 1 cwt. 2 qrs. 5 lb. how many allowances for ſeamen may be cut, each weighing 5 oz. 7 dr.? *Anſ.* $3563\frac{35}{87}$.

118. If 48 taken from 120 leaves 72, and 72 taken from 91 leaves 19, and 7 taken from thence leaves 12, what number is that, out of which, when you have taken 48, 72, 19 and 7, leaves 12? *Anſ.* 158.

119. A farmer ignorant in numbers, ordered £500 to be divided among his 5 ſons, thus: give A, ſays he $\frac{1}{3}$, B $\frac{1}{4}$, C $\frac{1}{5}$, D $\frac{1}{6}$, E $\frac{1}{7}$ part; divide this equitably among them, according to the father's intention.
Anſ. A £$152\frac{1392}{2754}$, B £$114\frac{1014}{2754}$, C £$91\frac{1386}{2754}$, D £$76\frac{696}{2754}$, E £$65\frac{996}{2754}$.

120. When firſt the marriage-knot was ty'd,
Between my wife and me,
Her age did mine as far exceed,
As three times three does three;
But when ſeven years, and half ſeven years,
We man and wife had been,
My age came then as near to her's,
As eight is to ſixteen.

Queſt. What was each of our ages when we married?
Anſ. 10 $\frac{1}{2}$ *years the man,* 31 $\frac{1}{2}$ *the woman.*

121. If 12 oxen will eat $3\frac{1}{3}$ acres of graſs in four weeks, and 21 oxen will eat 10 acres in 9 weeks, how many oxen will eat 24 acres in 18 weeks, the graſs being allowed to grow uniformly? *Anſ.* 36.

122. A lady was aſked her age, who replied thus:
My age if multiplied by three,
Two ſevenths of that product tripled be,
The ſquare root of two ninths of that is four;
Now tell my age, or never ſee me more.
Anſ. 28 *years.*

A TABLE.

A TABLE for finding the **INTEREST** of any sum of money for any number of months, weeks, or days, at any rate *per cent.*

Year.	Calen. Mon.	Weeks.	Day.
£.	£. s. d.	£. s. d.	£. s. d.
1	...—.. 1..8	..—..—.. 4½	—..—..—½
2	...—.. 3..4	..—..—.. 9	—..—.. 1¼
3	...—.. 5..—	..—.. 1.. 1¾	—..—.. 2
4	...—.. 6..8	..—.. 1.. 6½	—..—.. 2½
5	...—.. 8..4	..—.. 1..11	—..—.. 3¼
6	...—..10..—	..—.. 2.. 3¾	—..—.. 3¾
7	...—..11..8	..—.. 2.. 8¼	—..—.. 4½
8	...— .13..4	..—.. 3..—¾	—..—.. 5¼
9	..—..15..—	..—.. 3.. 5½	—..—.. 5¾
10	...—..16..8	..—.. 3..10¼	—..—.. 6½
20	... 1..13..4	..—.. 7.. 8¼	—..—1.. 1¼
30	... 2..10..—	..—..11.. 6½	—. 1.. 7¾
40	... 3.. 6..8	..—..15.. 4½	—.. 2 . 2¼
50	... 4.. 3..4	..—..19.. 2¾	—.. 2.. 9
60	... 5..—..—	.. 1.. 3..—¾	—.. 3.. 3½
70	... 5..16..8	.. 1.. 6 11	—.. 3 .10
80	... 6..13..4	.. 1..10.. 9¼	—.. 4.. 4½
90	... 7..10..—	.. 1..14.. 7¾	—.. 4..11¼
100	... 8.. 6..8	.. 1..18.. 5½	—.. 5.. 5¾
200	.. 16..13..4	.. 3..16..11	—..10..11½
300	.. 25..—..—	.. 5..15.. 4½	—..16.. 5¼
400	.. 33.. 6..8	.. 7..13..10	1.. 1..11
500	.. 41..13..4	.. 9 .12.. 3½	1.. 7.. 4¾
600	.. 50..—..—	.11..10.. 9	1..12..10½
700	.. 58.. 6..8	.13.. 9.. 2¾	1..18.. 4¼
800	.. 66..13..4	.15.. 7.. 8¼	2.. 3..10
900	.. 75..—..—	.17.. 6.. 1¾	2.. 9.. 3¾
1000	.. 83.. 6..8	.19.. 4.. 7¼	2..14.. 9½
2000	.166..13..4	.38.. 9.. 2¾	5.. 9.. 7
3000	.250 .—..—	.57. 13..10	8.. 4.. 4½
4000	.333.. 6..8	.76..18.. 5½	10..19.. 2
5000	.416..13..4	.96.. 3..—¾	13..13..11½
6000	.500..—..—	115.. 7.. 8¼	16.. 8.. 9
7000	.583.. 6..8	134..12.. 3½	19.. 3 . 6½
8000	.666..13..4	153..16..11	21..18.. 4¼
9000	.750..—..—	173.. 1.. 6¼	24..13.. 1¾
10,000	.833.. 6..8	192.. 6.. 1¾	27.. 7..11¼
20,000	1666..13..4	384..12.. 3½	54..15..10½
30,000	2500..—..—	576..18.. 5½	82.. 3..10

RULE. *Multiply the principal by the rate* per cent. *and the number of months, weeks, or days, which are required, cut off two figures on the right hand side of the product, and collect from the table the several sums against the different numbers as when added will make the number remaining. Add the several sums together it will give the interest required.*

N. B. *For every* 10 *that is cut off in months, add* 2d; *for every* 10 *cut off in weeks, add an halfpenny; and for every* 40 *in the days,* 1 *farthing.*

EXAMPLES.

1. What is the intereſt of £2467..10..–, for 10 months, at 4 per cent. per annum?

2467..10
4
9870..–
10
987|00

900=75..–..–
80= 6..13..4
7=–..11..8
987=82.. 5..–

2. What is the intereſt of £2467..10..–, for 12 weeks, at 5 per cent.?

2467..10
5
12337..10
12
1480|50..–

1000=19.. 4.. $7\frac{1}{4}$
400= 7..13..10
80= 1..10.. 6
–.. $2\frac{1}{2}$
1480=28.. 9.. $4\frac{3}{4}$

3. What is the intereſt of £2467..10..–, for 50 days, at 6 per cent.?

2467..10
6
14805..–
50
7402|50

7000=19..3.. $6\frac{1}{2}$
400= 1..1..11
2=–..–.. $1\frac{1}{4}$
–..–..– $\frac{1}{4}$
7402=20..5.. 7

To find what any eſtate, from 1 to £60,000 per annum, will come to for 1 day.

RULE. Collect the annual rent or income from the table for one year, againſt which take the ſeveral ſums for one day, add them together, it will give the anſwer.

An eſtate of £376 per annum, what is that per day?

300=–..16.. $5\frac{1}{4}$
70=–.. 3..10
6=–..–.. $3\frac{3}{4}$
376=1..–.. 7

To find the amount of any income, ſalary, or ſervant's wages, for any number of months, weeks, or days.

RULE. Multiply the yearly income or ſalary by the number of months, weeks, or days, and collect the product from the Table.

What will £270 per annum come to for 11 months, for 3 weeks, and for 6 days?

For 11 Months.

207	2000 =	166..13..4
11	900 =	74..—..—
	70 =	5..16..8
2970		
	2970 =	247..10..—

For 3 Weeks.

270	800 =	15..7.. 8¼
3	10 =	—..3..10
810	=	15..11..6¼

For 6 Days.

270	1000 =	2..14.. 9½
6	600 =	1..12..10½
	20 =	—.. 1.. 1
1620		
	1620 =	4.. 8.. 9

For the whole Time.

	247..10..—
	15..11..6¼
	4.. 8..9
	257..10..3¼

A TABLE, shewing the number of days from any day in the month to the same day in any other month, thro' the year.

From	To Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Jan.	365	31	59	90	120	151	181	212	243	273	304	334
Feb.	334	365	28	59	89	120	150	181	212	242	273	303
Mar.	306	337	365	31	61	92	122	153	184	214	245	275
Apr.	275	306	334	365	30	61	91	122	153	183	214	244
May	245	276	304	335	365	31	61	92	123	153	184	218
June	214	245	273	304	334	365	30	61	91	122	153	183
July	184	215	243	274	304	335	365	31	62	92	123	153
Aug.	153	184	212	243	273	304	334	365	31	61	92	122
Sep.	122	153	181	212	242	273	303	334	365	30	61	91
Oct.	92	123	151	182	212	243	273	304	335	365	31	61
Nov.	61	92	120	151	181	112	242	273	304	334	365	30
Dec.	31	62	90	121	151	182	212	243	274	304	335	365

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